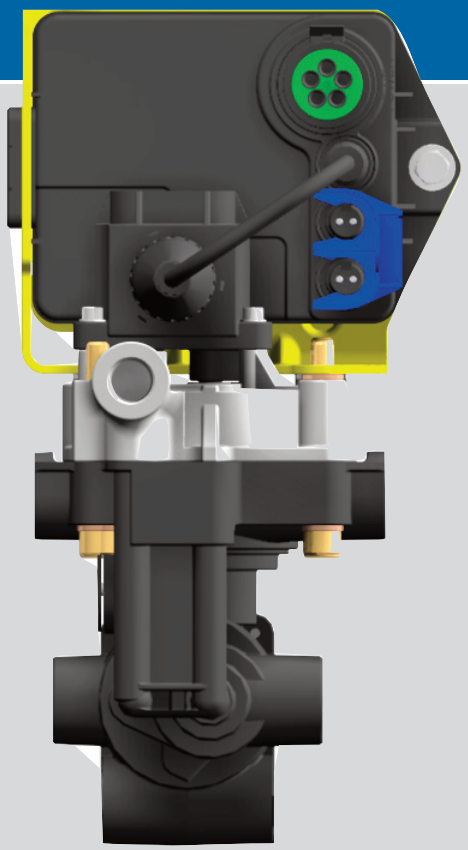
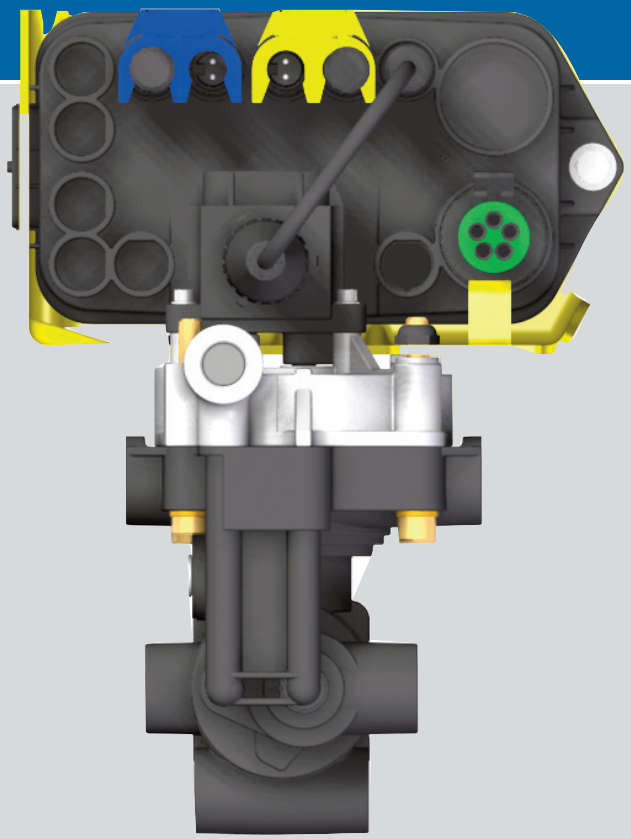
Installation/Service Guide



PLC Select 1M -FFABS



PLC Select 2M -FFABS

2S/1M - 4S/2M PLC Select Anti-Lock Braking Systems

L30041

Rev. 7 - 1/13

Haldex

Innovative Vehicle Solutions

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These manuals are available for download at (www.haldex.com).

L30041 - PLC Select 1M/2M FFABS Systems
L20243 - ABS Service Components Catalog
L31158W - Info Center Instruction Manual - (Web Only)
L31154W - PC Diagnostic Instruction Manual - (Web Only)

If you have any questions on these products or any of the Innovative Products offered by Haldex Brake Products, please contact your local distributor for more complete details.

SAFETY NOTICE

This installation manual describes the correct installation procedures for the Haldex PLC Select 1M and 2M for Trailers/Dollies. The PLC Select 1M and 2M may be used with either "Drum or Disc Brakes". Care must be taken during each phase of the installation in order to ensure the system is installed correctly.

Safety First!!!

Please follow your company's safety procedures when you install this equipment. Be sure that you understand all instructions before you begin.

Note: Remove all air pressure and electrical power from the brake system before beginning work.

IMPORTANT NOTICE

The data listed herein is correct to the best of Haldex's knowledge and belief, having been compiled from reliable and official sources of information. However, **HALDEX CAN NOT ASSUME ANY RESPONSIBILITY** for possible error or misapplication of the product. Final determination of the suitability of the products for the use contemplated by the Buyer is the sole responsibility of the Buyer. Haldex shall have no responsibility in connection with the suitability.

IMPORTANT NOTICE

The description and specifications contained in this Installation/Service Manual are current at the time of printing. Haldex Brake Products Corp. reserves the right to discontinue or modify its models and/or procedure and to change specifications at any time without notices.

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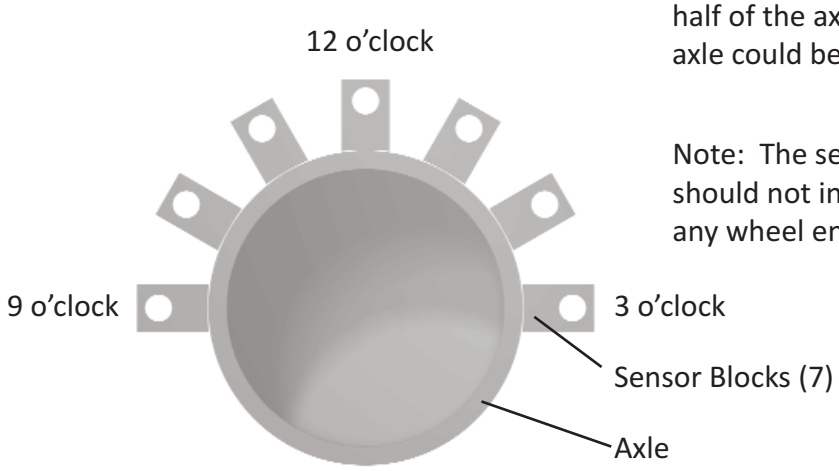
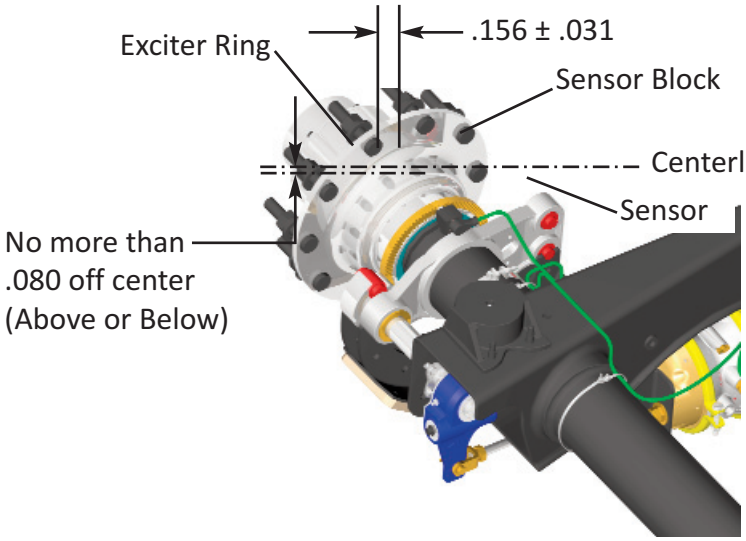
The radial clocking position should be between 9 and 3 o'clock. While the ABS performance is not affected with sensor location in the lower half of the axle, the structural integrity of the axle could be compromised.

Note: The sensor block should not interfere with any wheel end hardware.



Sensor Block Allowable Placement

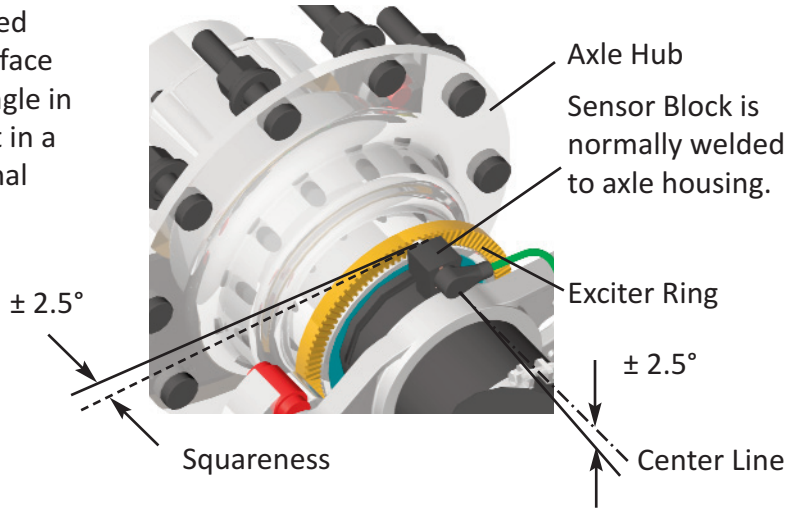


The clearance between the block and exciter ring should be 0.156 ± .031". Any deviation will result in a reduction of the wheel speed sensor signal output.

Sensor Block Allowable Clearance

In general, the position of the wheel speed sensor center axis to the exciter right surface should be as close as possible to a 90° angle in both directions. Any deviation will result in a reduction of the wheel speed sensor signal output.

Note: The sensor block is generally welded to the axle. Refer to axle manufacturer's manual to ensure that welding won't affect structural integrity.



2S/1M Configuration (Axle-By-Axle)

Multi-Axle Trailers (2-6 Port Valve)

Red Channel Valve
Blue Channel Valve
Yellow Channel Valve

Sensors should be installed on the least loaded axle or unloaded axle that locks first.

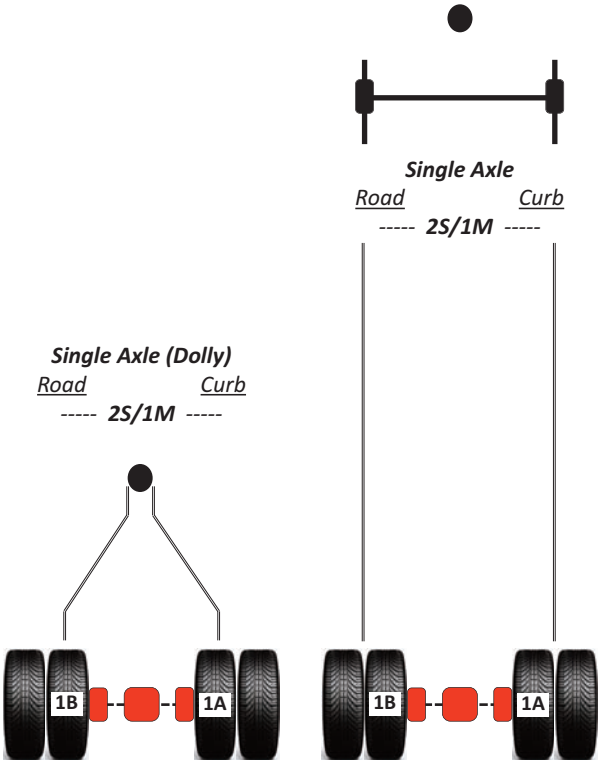
Recommended locations are shown in figures.

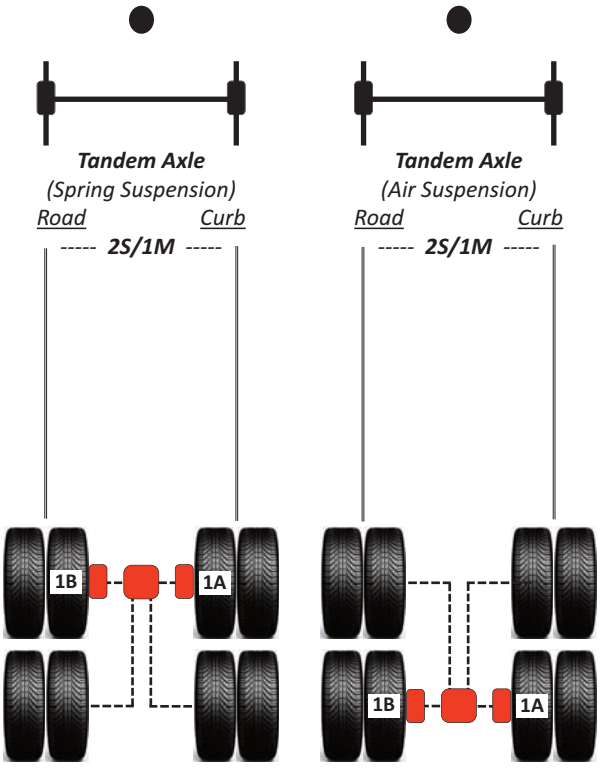
Sensor (1A) should be installed on (Curb Side).
Sensor (1B) should be installed on (Road Side).

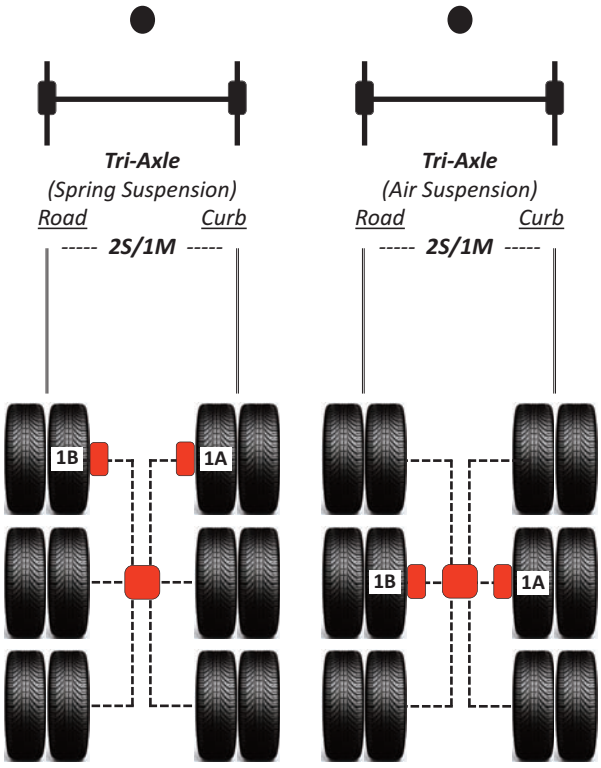
Make sure sensors are pushed firmly against the exciter ring.

Note: For dollies and single axle trailers, Haldex recommends “A8 ECU Configuration”.

Legend
Air Hose Line ----------
ABS Valve Cable ....







2S/2M Configuration (Side-By-Side)

Red Channel Valve
Blue Channel Valve
Yellow Channel Valve

Multi-Axle Trailers (2-6 Port Valve)

Sensors should be installed on the least loaded axle or unloaded axle that locks first.

Recommended locations are shown in figures.

Sensor (2A) should be installed on (Curb Side).
Sensor (2B) should be installed on (Road Side).

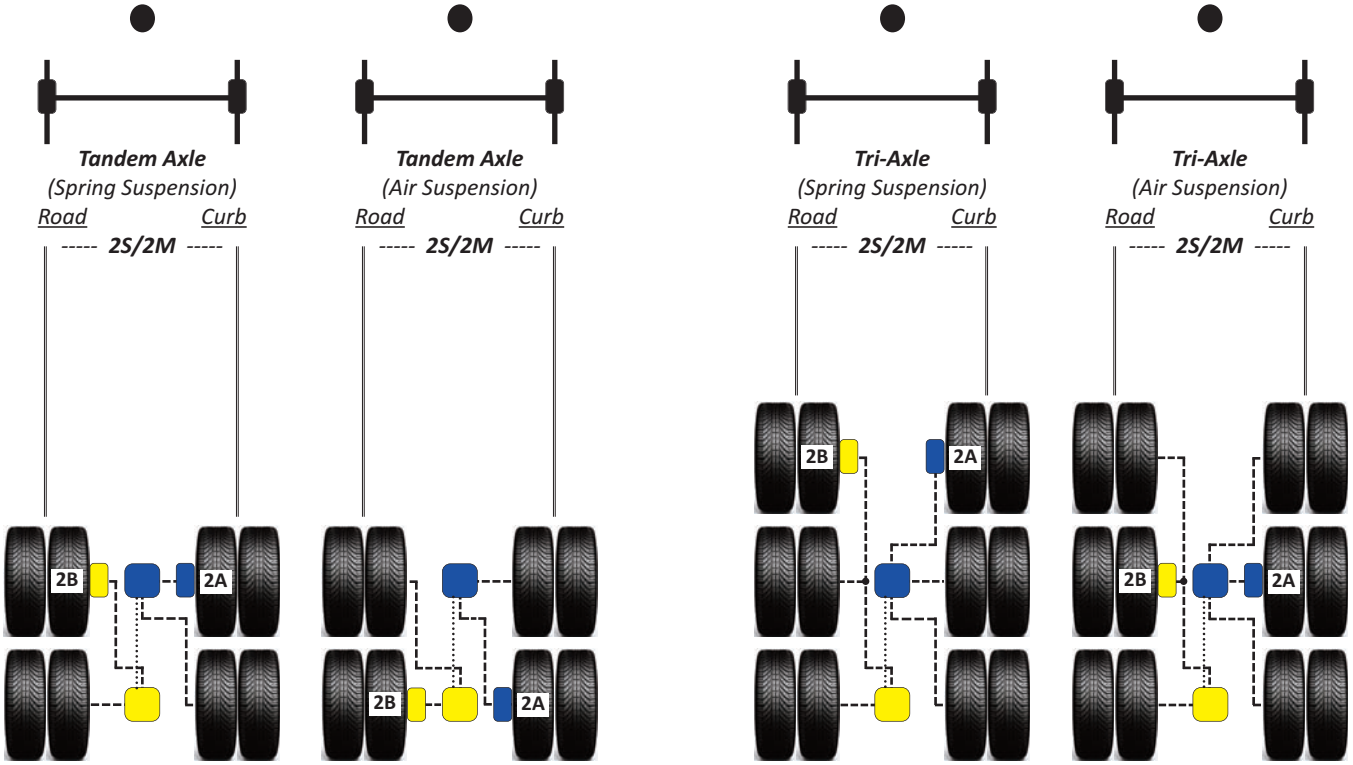
Make sure sensors are pushed firmly against the exciter ring.

Note: The 2S/2M configuration does not offer any meaningful performance benefit over a 2S/1M SLH-A7 configuration and is not a preferred system. To obtain additional performance beyond a 2S/1M configuration, Haldex recommends the use of a 4S/2M System.

Note: Any Non-Sense axle can be utilized as a lift axle.

Legend

Air Hose Line ----------
ABS Valve Cable ....



4S/2M Configuration (Side-By-Side)

Multi-Axle Trailers

Red Channel Valve
Blue Channel Valve
Yellow Channel Valve

Sensors should be installed on the least loaded axle or unloaded axle that locks first.

Recommended locations are shown in figures.

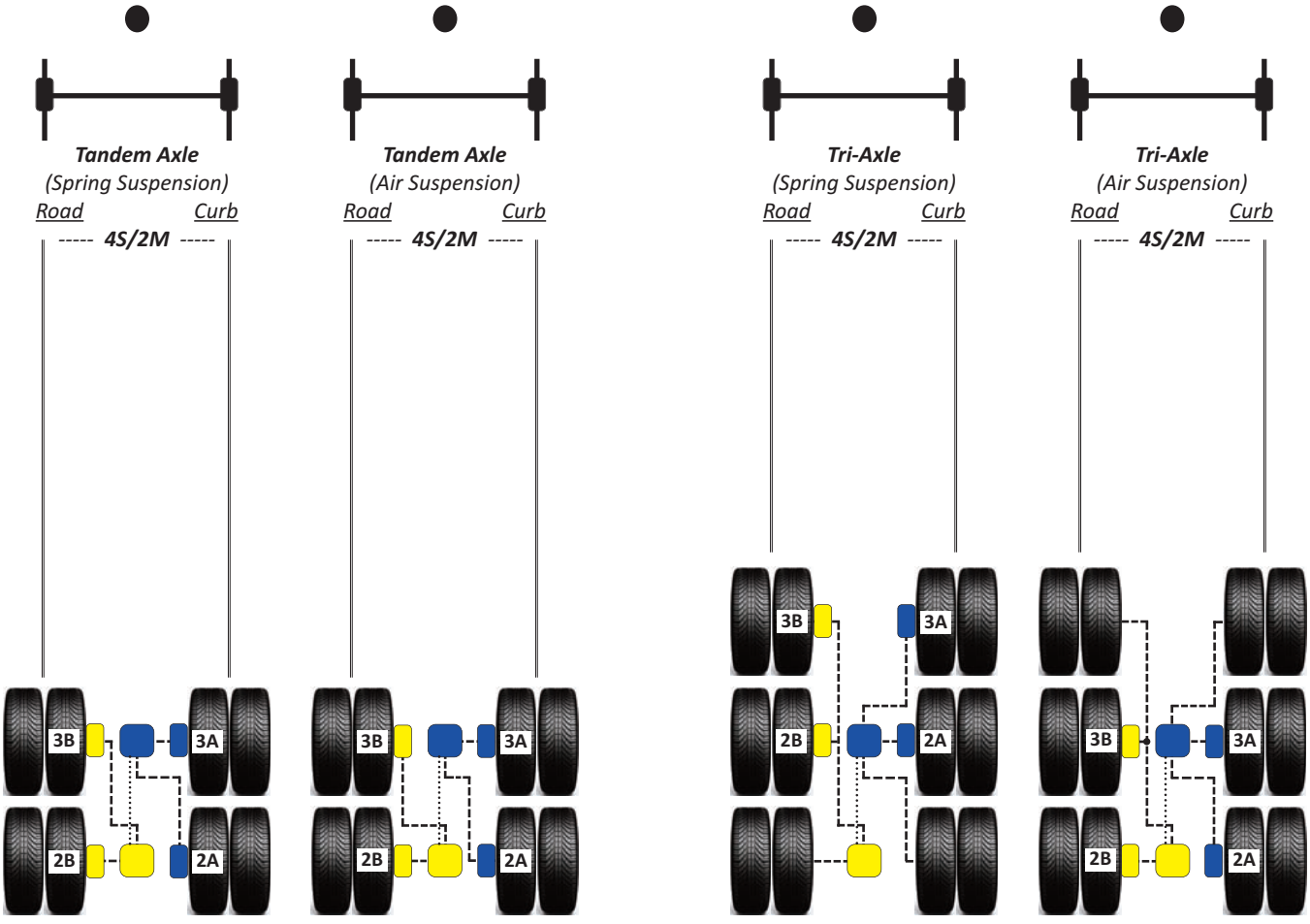
Sensors (3A, 2A) are installed on Curb Side.
Sensors (3B, 2B) are installed on Road Side

The yellow sensors must go with the Yellow ABS Valve and the blue sensors must go with the Blue ABS Valve.

Legend

Air Hose Line ----------

ABS Valve Cable ....



4S/2M Configuration (Side-By-Side)

Red Channel Valve
Blue Channel Valve
Yellow Channel Valve

Attention:

For 4S/2M (Side-By-Side) Applications - Sensors (S3A, S3B) must be used for a sensed lift axle

Multi-Axle Trailers

Sensors should be installed on the least loaded axle or unloaded axle that locks first.

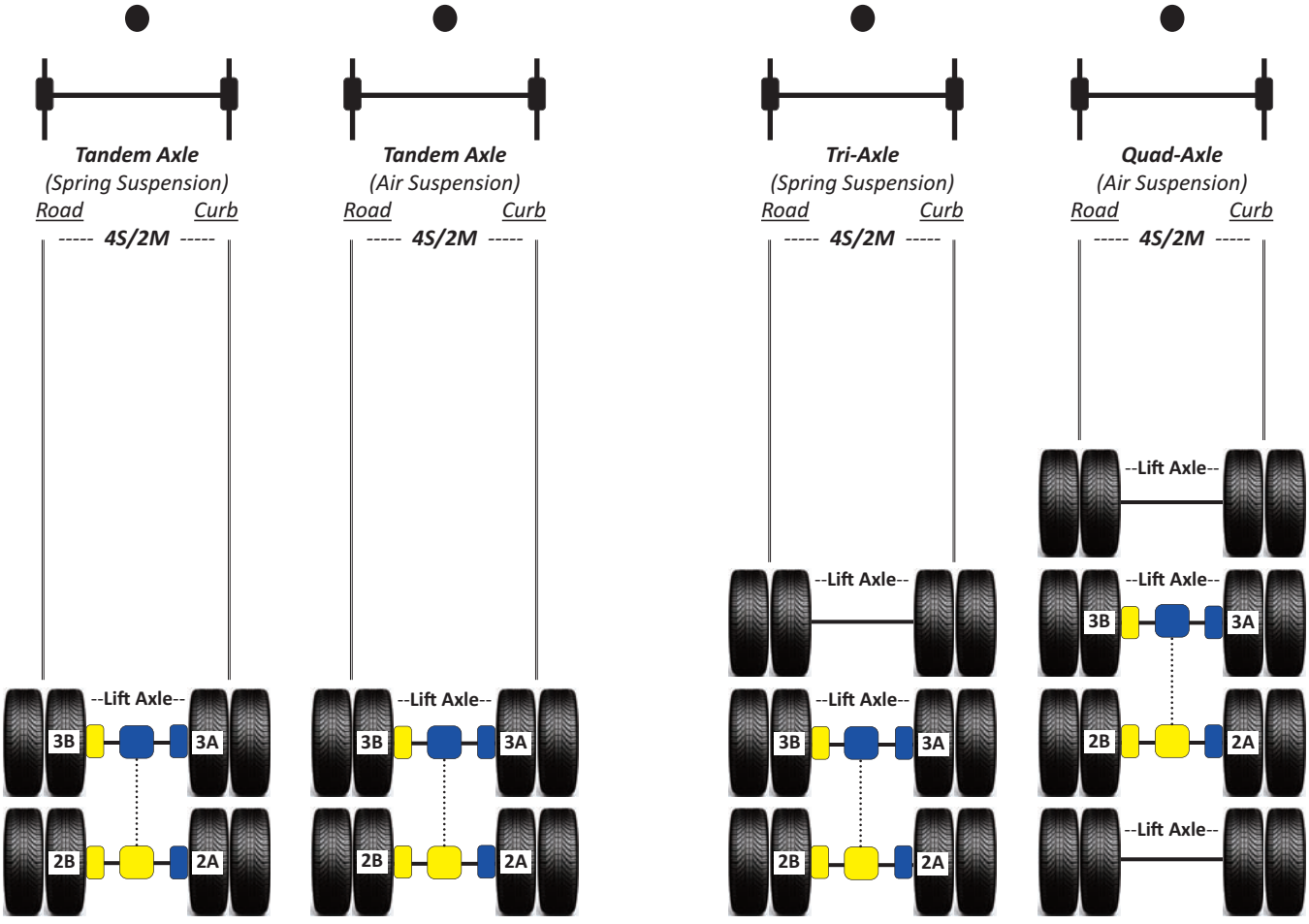
Recommended locations are shown in figures.

Sensors (3A, 2A) are installed on Curb Side.
Sensors (3B, 2B) are installed on Road Side

The yellow sensors must go with the Yellow ABS Valve and the blue sensors must go with the Blue ABS Valve.

Note: At least one axle with sensors has to be stationary on ground.

Lift Axle Control - (Side-By-Side) Configurations



4S/2M Configuration (Axle-By-Axle)

Multi-Axle Trailers

Red Channel Valve
Blue Channel Valve
Yellow Channel Valve

Sensors should be installed on the least loaded axle or unloaded axle that locks first.

Recommended locations are shown in figures.

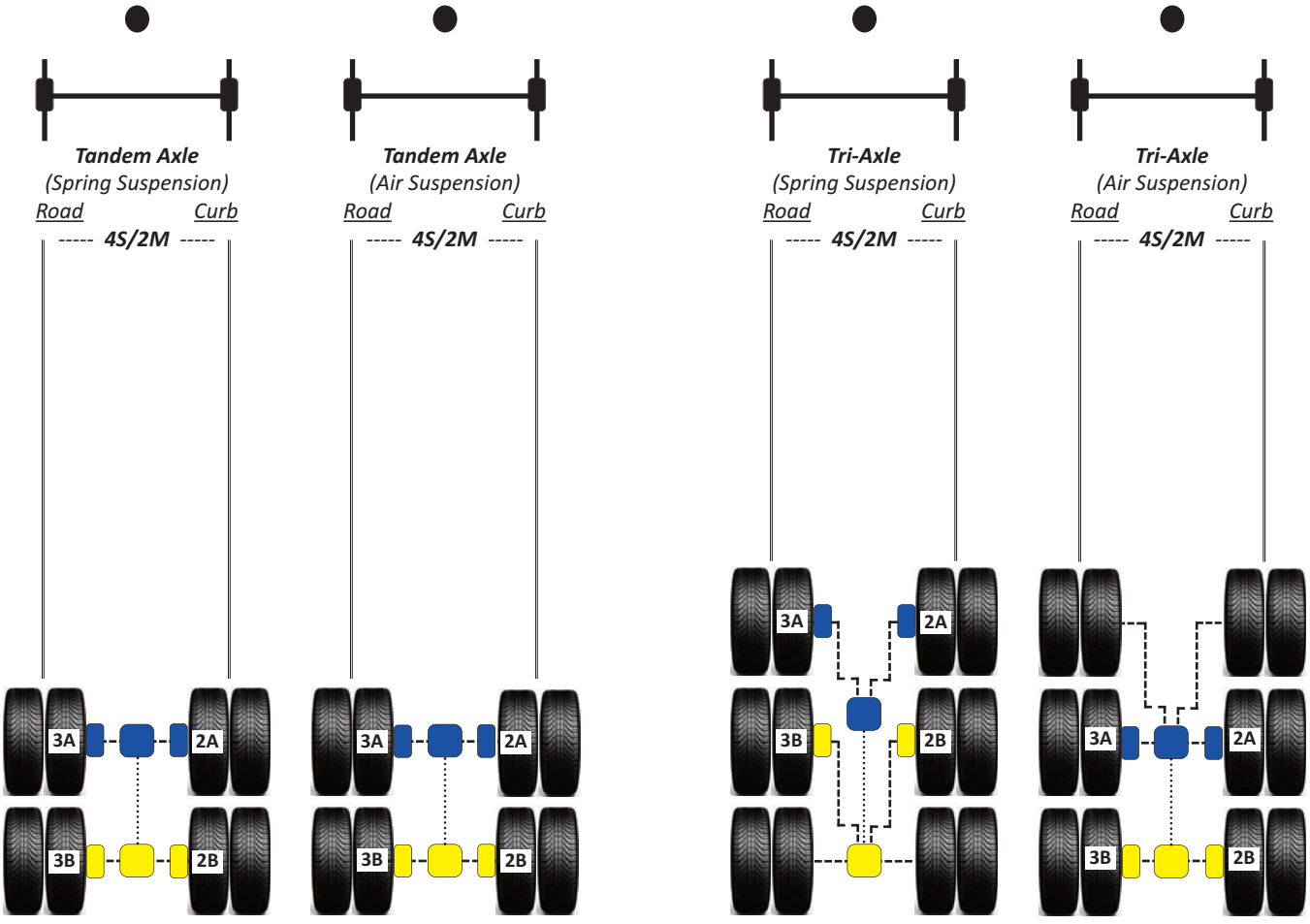
Sensors (2A, 2B) are installed on Curb Side.
Sensors (3A, 3B) are installed on Road Side.

The yellow sensors must go with the Yellow ABS Valve and the blue sensors must go with the Blue ABS Valve.

Legend

Air Hose Line - - - - - - - - - - - - - - - - - - -

ABS Valve Cable .....



4S/2M Configuration (Axle-By-Axle)

Red Channel Valve
Blue Channel Valve
Yellow Channel Valve

Attention:

For 4S/2M (Axle-By-Axle) Applications - Sensors (S2A, S3A) must be used for a sensed lift axle

Multi-Axle Trailers

Sensors should be installed on the least loaded axle or unloaded axle that locks first.

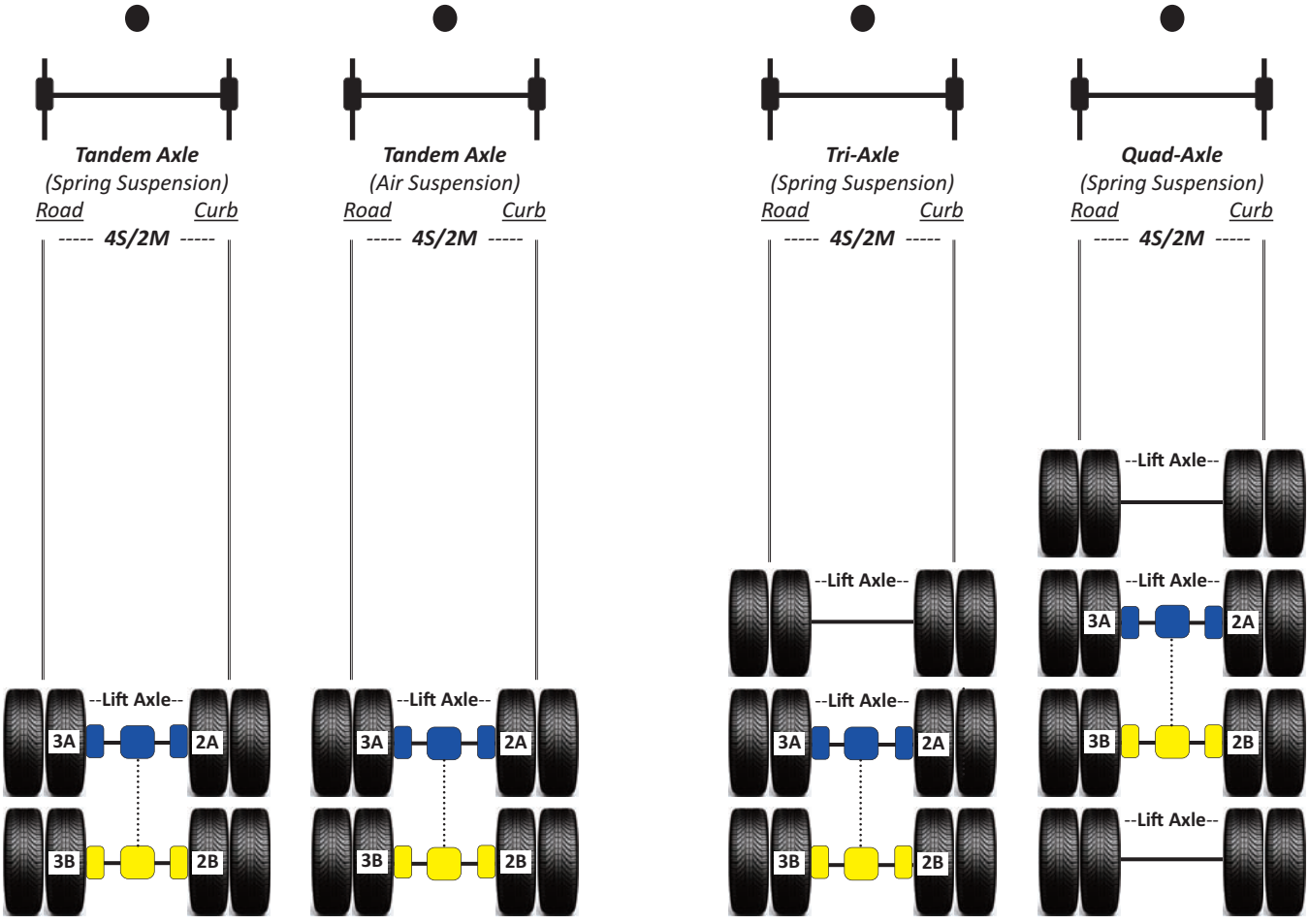
Recommended locations are shown in figures.

Sensors (2A, 2B) are installed on Curb Side.
Sensors (3A, 3B) are installed on Road Side.

The yellow sensors must go with the Yellow ABS Valve and the blue sensors must go with the Blue ABS Valve.

Note: At least one axle with sensors has to be stationary on ground.

Lift Axle Control - (Axle-By-Axle) Configurations



PLC Select 1M System Components

"See Haldex Trailer ABS Service Components Catalog (L20243) for additional information on Haldex ABS Brake Products"

Haldex Supplied Items

FFABS Valve (4-Port)

ABS Relay Valve (6-Port)

ABS Relay Valve (2-Port)

PLC Select 1M Valves

Additional Supplied Items

Sensor Block Clip

ABS Light

90° Sensor Cable

Trailer ABS Power Cable

Trailer Brake Control Valve (TBCV) shown or (RT4 Valve)

Haldex Diagnostic Tools

PLC PC Diagnostic (PC Not Included)

Software

Info Center

Optional

DLA+PLC Adapter

7-Way Diagnostic Interface Cable

Recommended Installation Aids

Tie Strap

Power Cable Clamp

Sensor Hose Clip

Power Cord Bracket

Sensor Retainer Clip

PLC Select 2M System Components

"See Haldex Trailer ABS Service Components Catalog (L20243) for additional information on Haldex ABS Brake Products"

Haldex Supplied Items

FFABS Valve (4-Port)

ABS Relay Valve (6-Port)

ABS Relay Valve (2-Port)

Solenoid Cable

PLC Select 2M Valves

Additional Supplied Items

Sensor Block Clip

ABS Light

90° Sensor Cable

Trailer ABS Power Cable

Trailer Brake Control Valve (TBCV) shown or (RT4 Valve)

Haldex Diagnostic Tools

PLC PC Diagnostic (PC Not Included)

Software

Info Center

Optional

DLA+PLC Adapter

7-Way Diagnostic Interface Cable

Recommended Installation Aids

Tie Strap

Power Cable Clamp

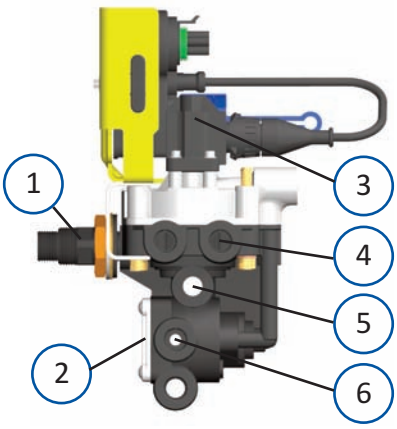
Sensor Hose Clip

Power Cord Bracket

Sensor Retainer Clip

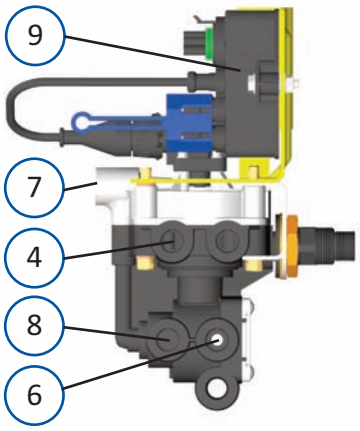
PLC Select 1M Valve - Overview

Left Side View



Front View

Right Side View



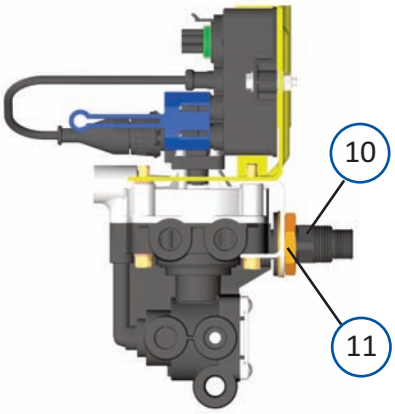
PLC Select 1M - FFABS Valve

Legend:

1. Reservoir Port 1/2” and 3/4” NPT
2. Spring Brake Exhaust Port
3. Solenoid
4. Service Brake Delivery Port (4)
5. Service Brake Exhaust Port
6. Spring Brake Delivery Port (4)
7. Service/Control Port
8. Emergency/Supply Port
9. ECU (Electronic Control Unit)
10. Tighten Nipple (Torque 50 ft. lb.)
11. Jam Nut (Torque 30 ft. lb.)

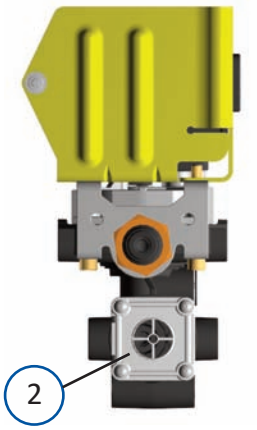
Notes:

1. FFABS Valve is commonly used for Tandem Axle Trailers.
2. For Single Axle Trailers use (2) Service Brake Port.
3. All ports are 3/8” NPT Service and Delivery.
4. Reservoir port 1/2” and 3/4” NPT.
5. Service/Control and Emergency/Supply have a serviceable “Filter Screen” (7 & 8) installed.
6. Attach hoses to appropriate brake chambers. Use liquid thread sealant sparingly on all fittings. (Loctite PST565 or Equivalent)
7. **Do Not** bottom out fittings it will damage FFABS Valve.

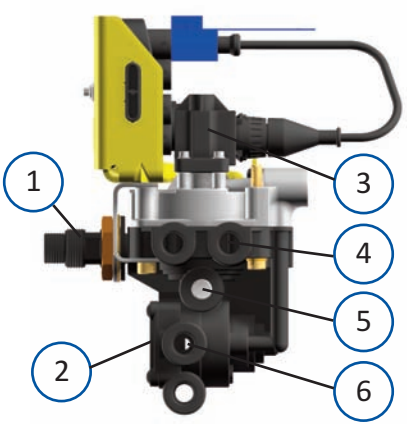


Black Exhaust Cover indicates “Service Brake Priority”

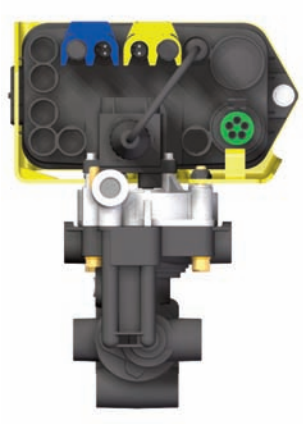
White Exhaust Cover indicates “Spring Brake Priority”



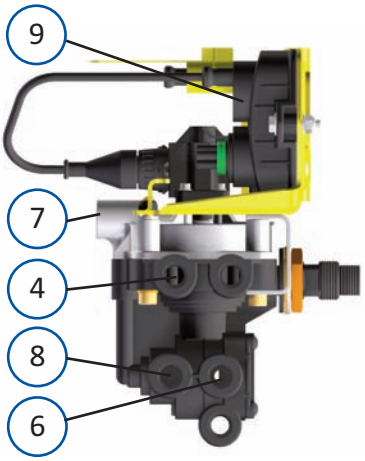
Left Side View



Front View



Right Side View



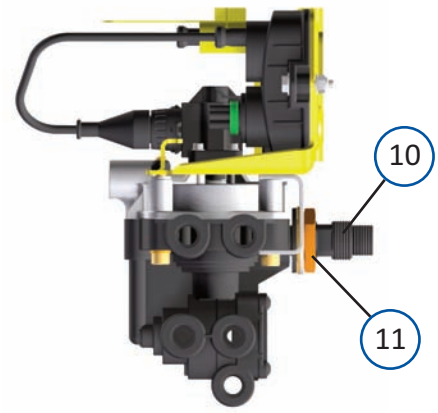
PLC Select 2M - FFABS Valve

Legend:

1. Reservoir Port 1/2” and 3/4” NPT
2. Spring Brake Exhaust Port
3. Solenoid
4. Service Brake Delivery Port (4)
5. Service Brake Exhaust Port
6. Spring Brake Delivery Port (4)
7. Service/Control Port
8. Emergency/Supply Port
9. ECU (Electronic Control Unit)
10. Tighten Nipple (Torque 50 ft. lb.)
11. Jam Nut (Torque 30 ft. lb.)

Notes:

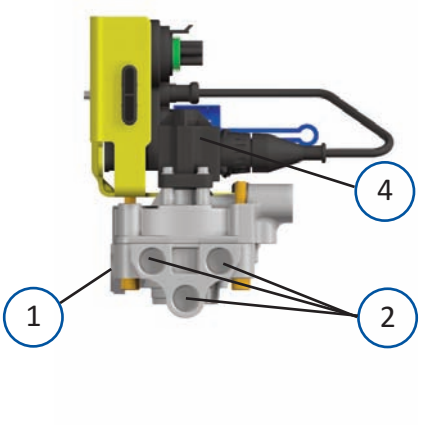
1. FFABS Valve is commonly used for Tandem Axle Trailers.
2. For Single Axle Trailers use (2) Service Brake Port.
3. All ports are 3/8” NPT Service and Delivery.
4. Reservoir port 1/2” and 3/4” NPT.
5. Service/Control and Emergency/Supply have a serviceable “Filter Screen” (7 & 8) installed.
6. Attach hoses to appropriate brake chambers. Use liquid thread sealant sparingly on all fittings. (Loctite PST565 or Equivalent)
7. **Do Not** bottom out fittings it will damage FFABS Valve.



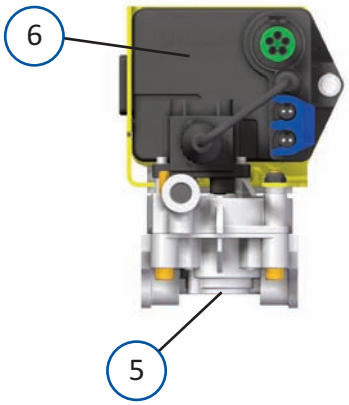
Black Exhaust Cover indicates “Service Brake Priority”

White Exhaust Cover indicates “Spring Brake Priority”

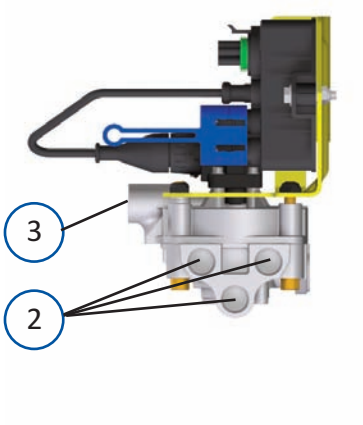
Left Side View



Front View



Right Side View



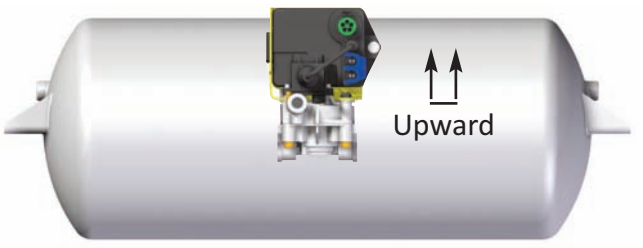
PLC Select 1M - 6-Port ABS Relay Valve

Legend:

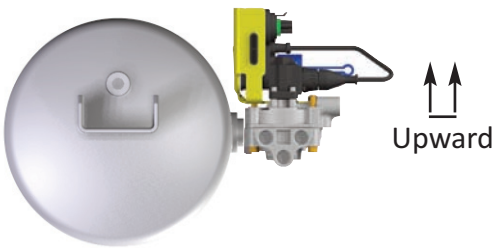
1. Reservoir Port 1/2” NPT
2. Service Brake Delivery Ports (6)
3. Service/Control Port
4. Solenoid
5. Service Brake Exhaust Port
6. ECU (Electronic Control Unit)

Notes:

1. Requires heavy wall reservoir nipple.
2. All ports are 3/8” NPT except for reservoir port.
3. **Do Not** use teflon tape on fittings.
4. 6-Port ABS Relay Valve must face upward.
5. Attach hoses to appropriate brake chambers. Use liquid thread sealant sparingly on all fittings. (Loctite PST565 or Equivalent)

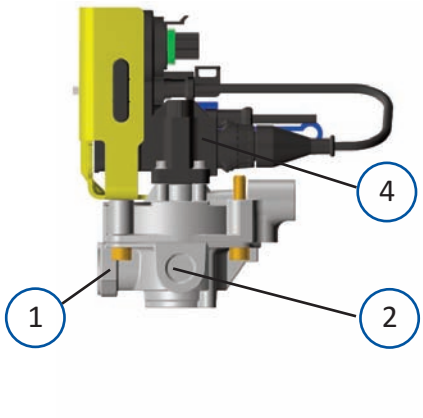


6-Port ABS Relay Valve
“Must Point Upward”

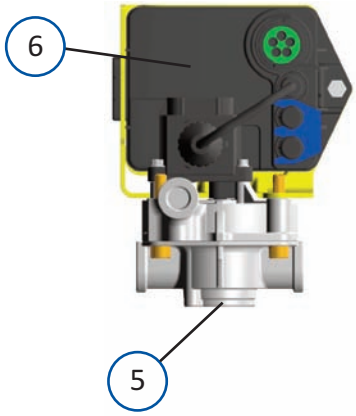


Left Side View

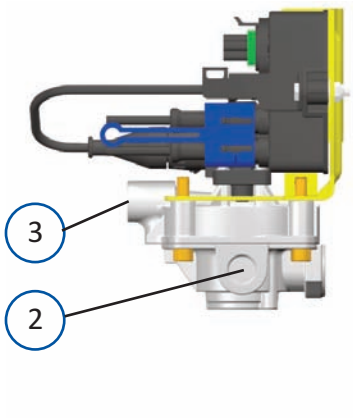
Left Side View



Front View



Right Side View



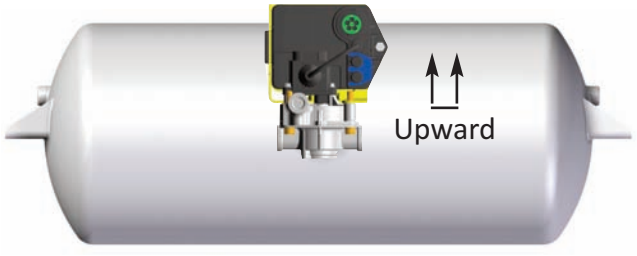
PLC Select 1M - 2-Port ABS Relay Valve

Legend:

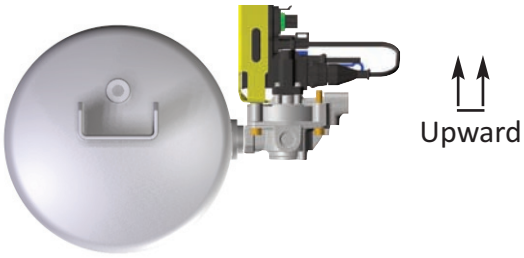
1. Reservoir Port 1/2” NPT
2. Service Brake Delivery Ports (2)
3. Service/Control Port
4. Solenoid
5. Service Brake Exhaust Port
6. ECU (Electronic Control Unit)

Notes:

1. Requires heavy wall reservoir nipple.
2. All ports are 3/8” NPT except for reservoir port.
3. **Do Not** use teflon tape on fittings.
4. 2-Port ABS Relay Valve must face upward.
5. Attach hoses to appropriate brake chambers. Use liquid thread sealant sparingly on all fittings. (Loctite PST565 or Equivalent)



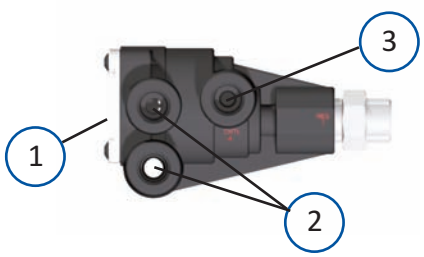
2-Port ABS Relay Valve
“Must Point Upward”



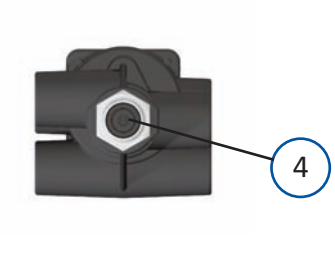
Left Side View

Trailer Brake Control Valve - Overview

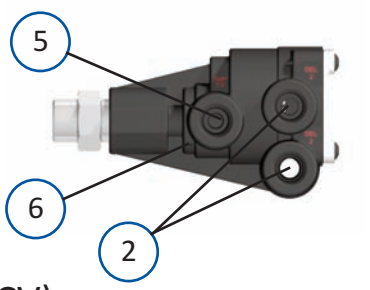
Left Side View



Front View



Right Side View



Trailer Brake Control Valve (TBCV)

Legend:

1. Exhaust Port
2. Spring Brake Delivery Ports (4)
3. Service/Control Port
4. Reservoir Port 1/2” NPT
5. Emergency/Supply Port 3/8” NPT
6. Vent Hole

Notes:

1. Requires heavy wall reservoir nipple.
2. All ports are 3/8” NPT except for reservoir port.
3. **Do Not** use teflon tape on fittings.
4. Trailer Brake Control Valve (TBCV) must face upward.
5. Attach hoses to appropriate brake chambers. Use liquid thread sealant sparingly on all fittings. (Loctite PST565 or Equivalent)
6. **Do Not** bottom out fittings it will damage Trailer Brake Control Valve (TBCV).
   See page 17 (Items 1 and 2) for plastic threads.
7. Service/Control & Emergency/Supply ports have a serviceable “filter screen” (3 & 5).

Trailer Brake Control Valve (TBCV)
“Must Point Upward”

Left Side View

Left Side View

Typical Tank Mounting Valve Orientation

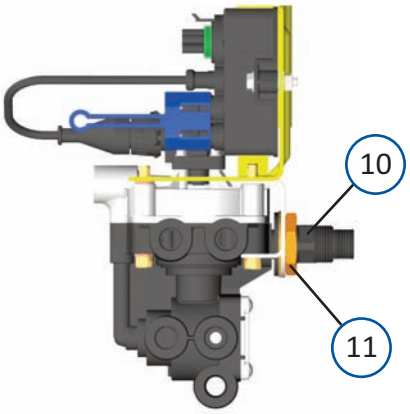
1. Attach hoses to appropriate brake chambers. Use liquid thread sealant sparingly on all fittings. (Loctite PST565 or Equivalent)
2. For plastic ports, hand tighten fittings then rotate 1 to 1-1/2 additional turns. The maximum torque allowed is 210 in. lb.
3. Install valve nipple into reservoir port. Use 7/8" wrench to tighten the nipple.
4. Using a 1-1/2" wrench tighten the jam nut to 30 ft. lb., while holding the nipple with a 7/8" wrench. See detail below (No. 11).

Note: If frame mounted, follow the same procedure for Valve Orientation. Valve Solenoid on a 2-Port ABS Relay Valve, 6-Port ABS Relay Valve, or FFABS Valve must be facing upward when the trailer is in normal operation or service ABS performance could be affected.

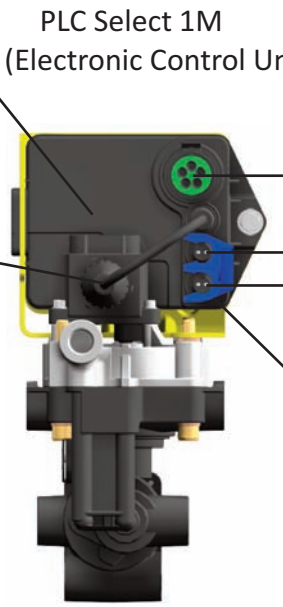
Warning:
Proper installation Valve Orientation shown above; otherwise, warranty is **VOID**. Installation behind the tank is recommended, facing the back of trailer.

Legend:

10. Tighten Nipple (Torque 50 ft. lb.)
11. Jam Nut (Torque 30 ft. lb.)



PLC Select 1M - ABS Power Cord Call Out

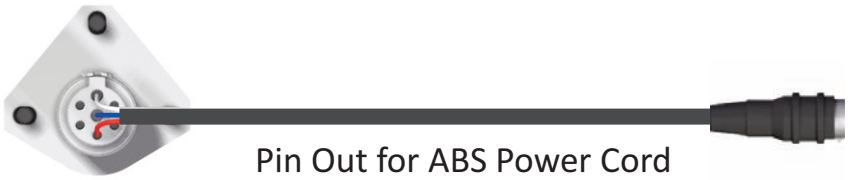


Note: When installing and servicing always apply small amount of dielectric grease to all electrical connections.

Note: Use Blue ECU Sensor Retainer clip to hold Sensor SA1 and SB1 in place.

Correct location of the wheel speed sensors at wheel ends is critical for proper ABS operation and troubleshooting. The PLC Select 1M will adjust the braking pressure in response to the input from the speed sensors. Incorrect installation or location of speed sensors, sensor block clips and exciter ring will result in poor ABS performance or sensors crossed leading to incorrect diagnostic troubleshooting.

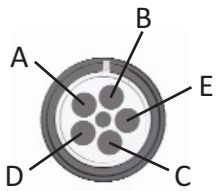
The figure above shows the correct power and speed sensor connections on the PLC Select 1M ECU.



Pin Out for ABS Power Cord

SAE J560

Pin #1 Ground (White)
Pin #7 Permanent (Blue)
Pin #4 Stoplight (Red)



"A" Stop Light (Red)
"B" Permanent (Blue)
"C" Not Used
"D" Trailer Light (Green/White)
"E" Ground (White)

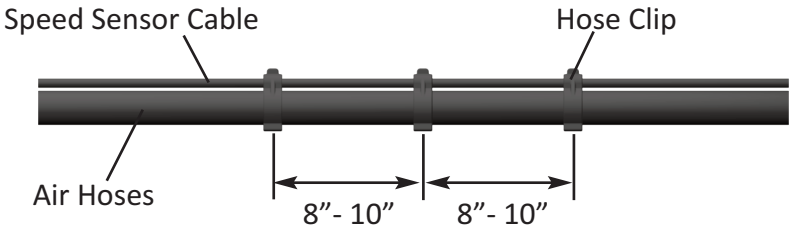
Note: Federal Regulations mandate that new trailers, built after 03/01/2001, have the capability to provide an ABS fault signal from the Trailer ABS into the tractor for an In-Cab Trailer ABS Lamp.

Option 1 is through Industry Standard "PLC4Trucks" Multiplexing (signal is carried on pin #7).

Haldex recommends that the Red, White, and Blue wires should be 12 AWG min.

PLC Select 1M/2M - Speed Sensor Cable Routing

Hose Clip



Although it is possible to route cables along the axle, the preferred method is to route the speed sensor cable along the air hoses between the ABS Valve and the Brake Actuators.

Do Not use tie straps to secure the speed sensor cable to air the hoses. Air hoses expand and can damage wires. For a more reliable installation use sensor hose clips to secure speed sensor cables to rubber air hoses. See above (Hose Clip).

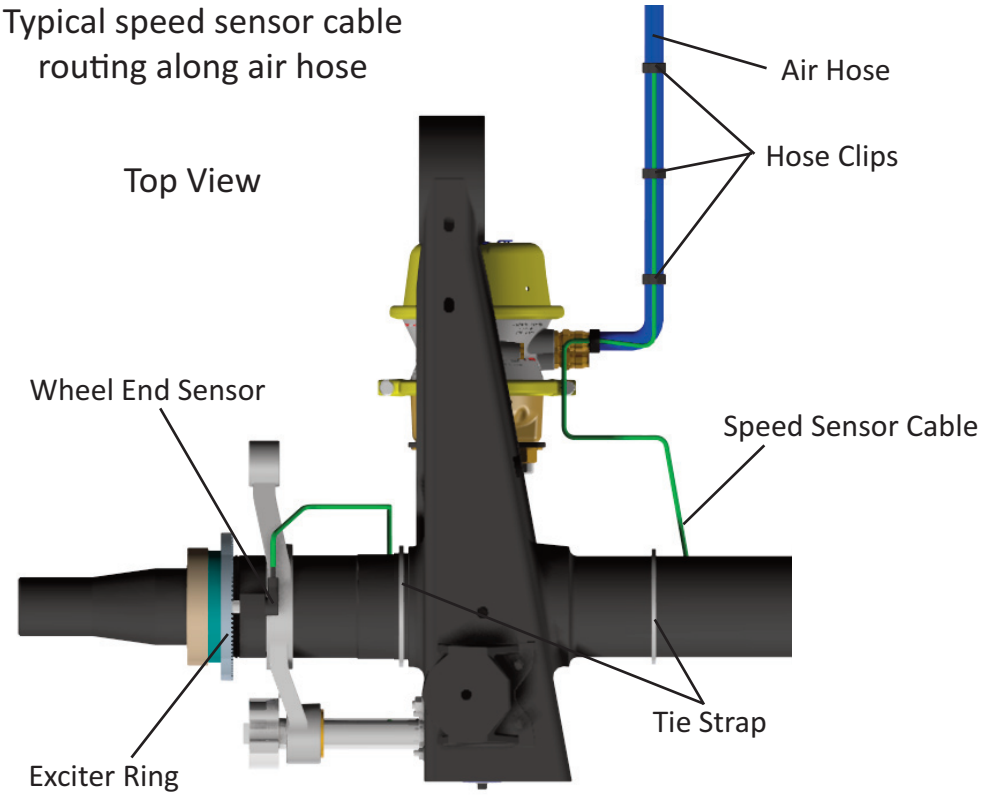
Leave some slack in cables to accommodate movement between chassis components. Excess cable **Must Not** be allowed to hang freely and must be bundled and attached to the chassis to prevent damage due to vibration and abrasion.

Route speed sensor cable on the backside of axle housing to avoid damage from road debris.

Excess speed sensor cable may be taken up in either a “Short Bone” or a “Long Bone” arrangement and secured with tie straps. **Do Not** coil the speed sensor cable into a loop smaller than 4” inches diameter. **Do Not** over tighten the tie straps when the cable is coiled, as this could result in a cable failure.

Typical speed sensor cable routing along air hose

Top View

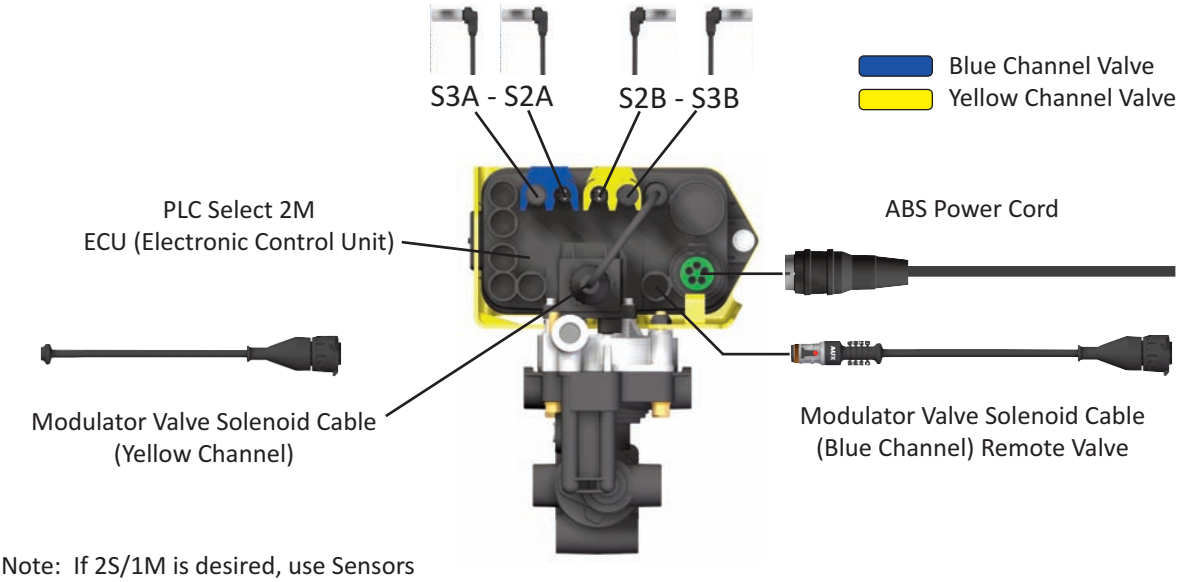


Short Cable
(Short Bone)

Push up and attach tie strap

Long Cable
(Long Bone)

PLC Select 2M - Cable Connection - Callout

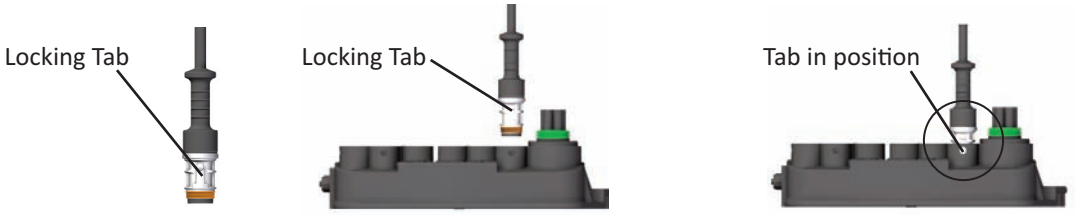


Note: If 2S/1M is desired, use Sensors (S2B and S3B). Use blanking plugs in un-used Sensor Connections.

Note: When installing and servicing always apply small amount of dielectric grease to all electrical connections.

Always ensure that ABS Power Cord is locked into place.

Modulator Valve Solenoid Cable Cut-away section of Tab Locked into hole



Verify connection Locking Tab (shown above) is facing downward and secure. If the Modulator Valve Solenoid Cable can be removed without releasing the Locking Tab, verify connection orientation.

Correct location of the Speed Sensors at the Wheel Ends is critical for proper ABS Operation. Incorrect installation or location of Speed Sensors and Exciter Rings will result in poor ABS Performance or sensors crossed leading to incorrect Diagnostic Troubleshooting. The figure above shows the correct power and speed sensor connections on the PLC Select 4S/2M ECU (Electronic Control Unit). See Haldex Trailer ABS Service Components Catalog “L20243” for sensor extensions, if short sensors are used.

PLC Select 1M/2M - Chassis End Of Line Testing

Trailer Testing

No Battery Charger

Test Equipment:

1. Use a 12 Volt DC Source (**Never Use** a battery charge, internal **damage** to the ECU will occur).
2 Power Cable with a Packard 5-pin male connection and ABS Test Light attached.
3. Shop Air (100 - 120 psi max.)

Chassis Test/End of Line ABS Check Procedure:

1. Charge the Emergency/Supply and Service/Control air systems.
2. Apply power source to 7-Way receptacle (Pin 7-Permanent Power).
3. The ABS Valve(s) should "**blow down**" first. You will hear a brief shot of exhaust air from each valve. The Yellow Channel (Remote Valve) should "**blow down**" first followed by the Blue Channel (ECU Valve) (for a 2S/1M system the Red Channel Valve only).
4. The ABS Light should illuminate for about 3 seconds and then turn off.
5. Using an Info Center or PC Software verify correct sensor placement by spinning each wheel end (one at a time). Reference to (Pages 4 - 9) for correct placement (Axle-By-Axle or Side-By-Side).
   Reference for Info Center Instructions Manual "L31158W".
   Reference for PC Diagnostic Instruction Manual "L31154W".
6. When using a PC in conjunction with Haldex PC Diagnostics, information such as the name of the inspector, the date inspected, or the trailer VIN can be stored in the ABS ECU (Electronic Control Unit).

Note:

If the ABS Light never illuminates or stays illuminated during the ABS check. Reference Troubleshooting Section on (Page 33) of this manual.

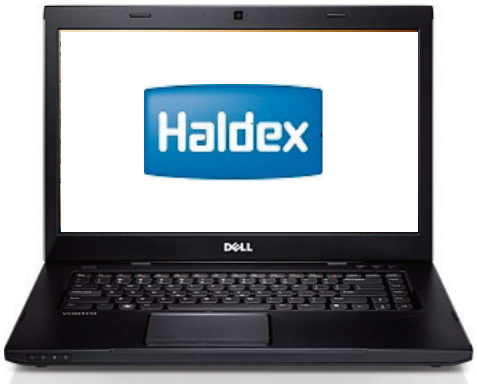
Road Testing Procedure:

1. Connect a tractor to the trailer and charge the trailer's air tanks (100 - 120 psi).
2. Turn on the start switch and ensure that the ABS Warning Light comes on about 3 seconds, then goes out.
3. Pull the trailer at a speed greater than 6 mph, make a brake application and hold until the trailer has come to a complete stop.
4. Verify that the ABS Warning Light has remained "**OFF**". If the ABS Warning Light remained "**OFF**", the system is functioning properly.
5. If the ABS System detected an error during the brake application, the ABS Warning Light will be "**ON**". If the ABS Warning Light never comes "**ON**" when the start switch is turned "**ON**", then reference the "**NO**" ABS Warning Light Illumination Section on (Page 33) of this manual. If the ABS Warning Light stays "**ON**" with the start switch "**ON**", reference the ABS Warning Light Stays On Permanently Section on (Page 33) of this manual.

Notes:

1. Disconnect power from the ABS System before making any repairs.
2. Most ABS problems are related to the following items:
    a. Cut or Damaged Wires
    b. Corroded Connector or Terminals
    c. Connector Terminals not Latched or Seated correctly to Mating Assemblies
    d. Excessive Sensor Air Gap, Sensor Clip Retention or Wheel Bearing End Play
    e. Insufficient power at the ABS Power Cable (12 - 15 Volts DC)
3. After making any repairs go to the "Diagnostic Tools" section of this manual (Pages 24 - 26) to confirm that the fault is corrected. If Dynamic Fault Codes 11 - 16 or 21 - 26 have occurred the ABS Warning Light will remain "**ON**" with a code "**07**" when repowered until the problem has been corrected. After correcting the Stored Fault(s), each affected wheel must spin > 1 mph utilizing permanent power for the ABS System to recognize the problem has been corrected. Verify the ABS Light turns "**OFF**" before clearing Stored Dynamic Fault Codes.

Info Center



PC Diagnostic Kit
(PC Not Included)

Software

Blink Codes

DLA+/PLC
Adapter

Diagnostic Tools
for
PLC Select 1M/2M Systems

In North America, Please Call

Haldex Brake Products
10930 North Pomona Ave
Kansas City, Missouri 64513

Technical Service & Engineering Support
1 (800) 643-2374 (Press 2) or Ext. 2337

In Canada, Please Call

Brake System Division
Haldex Limited
500 Pinebush Road, Unit 1
Cambridge, ON
N1T 0A5
Canada

Technical Service & Engineering Support
1 (800) 267-9247 (Press 2)

Haldex provides (3) Methods for ABS Diagnostics:

1. Blink Codes
2. PLC Info Center
3. PLC PC Diagnostic

Blink Codes

Info Center

PLC PC Diagnostic

Blink Codes:

ABS Faults Codes can be accessed using the ABS Light without the use of any other tools. The Blink Code "Simple Fault Mode" can be activated switching ignition power "**ON**", "**OFF**", "**ON**" in 1 second intervals. See Blink Code information (Pages 29 - 33).

PLC Info Center:

The PLC Info Center has a screen that can display ABS Fault Codes plus a number of other functions. The PLC Info Center only needs to be connected to vehicle Permanent Power and ground. An optional SAE 560 7-Way Diagnostic Interface Cable is also available.

Available Functions Include:

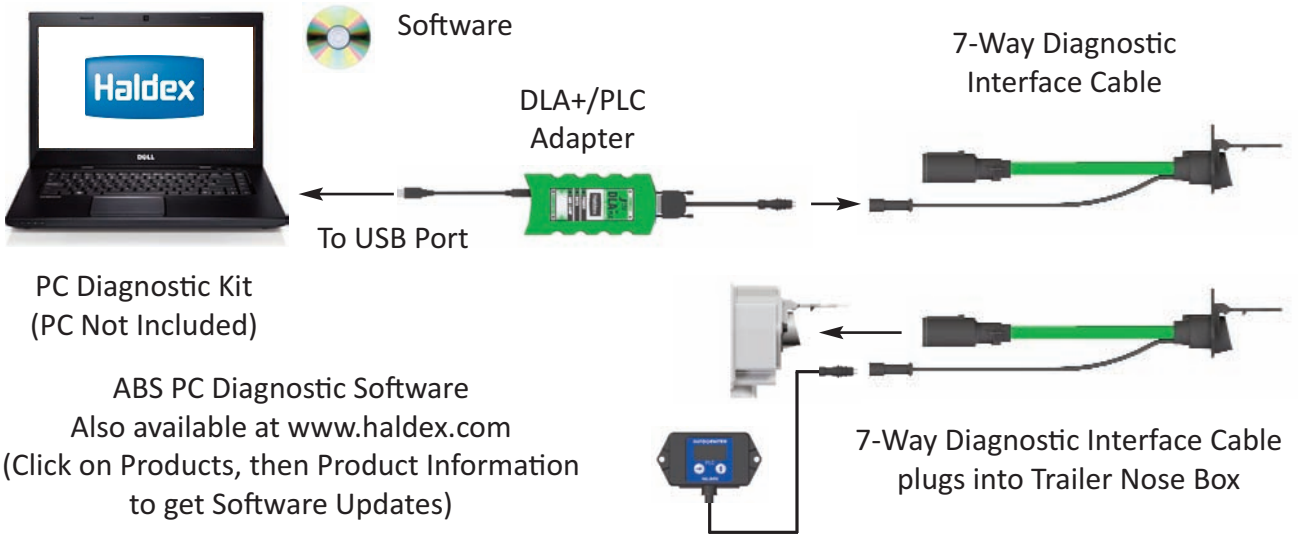
1. View active fault code(s) (2 digit code) and fault occurrence count (9 - Occurrences Max.).
2. View stored fault code(s) and fault occurrence count (9 - Occurrences Max.).
3. Clear stored fault code(s).
4. View wheel speed sensor identification corresponding to each individual wheel when rotated.
5. View sensor and valve configuration code.
6. View ABS ECU (Electronic Control Unit) type and Serial Number.
7. Energize valve solenoid(s).
8. Odometer
    - View Odometer, Tire Scale Factor, (Miles or Kilometer)
    - Service Interval, View or Clear Trip Distance
    - Modify Tire Scale Factor Size (Miles or Kilometer), and Modify Service Interval

Note: Reference PLC Info Center Instruction Manual "L31158W".

PLC PC Diagnostic:

1. Same information as PLC Info Center 1- 8.

PLC Select 1M/2M - Diagnostic Tools



PLC PC Diagnostics:

Displays the most information. Available functions include all the functions of the Info Center as well.

1. View ABS ECU (Electronic Control Unit) Part Number.
2. Save ABS Diagnostic results for a print out of test verification.
3. Read/Write Trailer and/or Service Data internally to ABS ECU (Electronic Control Unit).

Minimum Requirements: MS Windows 95, 98, 2000, NT, XP and Vista, Window 7, 32 MB RAM

Note: PLC Info Center and PLC PC Diagnostics are not compatible with older generation of ABS manufactured prior to March 2001.

Reference PC Diagnostic Instruction Manual “L31154W”.

Third Party Diagnostic Solution Tools:

1. Lite Check - Inspector 910B
2. NEXIQ - Brake-Link™
3. NEXIQ - Prolink IQ
4. NEXIQ - J1708 with USB link
5. Norgen - DLA+
6. BENDIX® - TRDU™

These tools have been evaluated by Haldex Brake Products - Kansas City, MO.

PLC Select 1M/2M - Blink Code Diagnostics

Blink Code Modes:

Apply Service Brake and then cycle Permanent Power (1 second “ON” / 1 second “OFF”)

Mode	Description	Permanent Power Cycles (1 Sec. ON, 1 Sec. OFF) when Stop Light Power Applied
1	Simple/Wheel Speed Mode	ON, OFF, ON
2	Active Faults Mode	ON, OFF, ON, OFF, ON
3	Stored Faults/Clear Mode	ON, OFF, ON, OFF, ON, OFF, ON
4	Configuration Mode	ON, OFF, ON, OFF, ON, OFF, ON, OFF, ON
5	Odometer	ON, OFF, ON, OFF, ON, OFF, ON, OFF, ON, OFF, ON

Procedure for Blink Code Diagnostics:

1. The trailer must be stationary.
2. The trailer must be connected to a DC power supply (10 - 15 volts). Never use a battery charger.
3. Permanent Power must be cycled “**ON**” and “**OFF**” (trailer auxiliary circuit) at 1 second intervals to reach the desired mode (shown above). It is recommended that an auxiliary switched power source be used (i.e. light cart).

Note: Stop Light and Permanent Power must be independent for Blink Code Troubleshooting. If Permanent Power is required for your brake light to operate, then Blink Code Diagnostics will not function.

Procedure Notes:

1. Once Blink Mode is entered that mode can only be terminated by completely disconnecting all trailer power sources.
2. All modes repeat endlessly. Each repeat is separated by 10 seconds of continuous light energization.
3. All codes are separated by 2 seconds of light “**OFF**”.
4. Stored Fault Codes (Mode 3) are followed by an occurrence count which display a blink rate twice as fast as the Fault Code Blink rate.

Mode 1 - Simple Mode Diagnostics:

This mode has an abbreviated list of Fault Codes that will display. Fault Codes are grouped to simplify the diagnostics. Up to 3 active codes will be displayed at one time. These faults need to be repaired before other active faults can be displayed. See Simple Mode Faults Codes Table on next page.

PLC Select 1M/2M - Blink Code Diagnostics

Mode 1 - Simple Mode Diagnostics Fault Table (ON, OFF, ON):

See the Diagnostic Code (Pages 36 - 40) for possible cause.

Item	Flash Count	Actual Fault
System OK	Light Stay On	07 (No Active Faults)
Sensor 1A	1 Flash	01
Sensor 1B	2 Flashes	02
Sensor 2A	3 Flashes	03
Sensor 2B	4 Flashes	04
Sensor 3A	5 Flashes	05
Sensor 3B	6 Flashes	06
Red Valve	7 Flashes	61, 67, 71, 77, 81, and 87
Blue Valve	8 Flashes	62, 68, 72, 78, 82, and 88
Yellow Valve	9 Flashes	63, 69, 73, 79, 83, and 89
Low Voltage	10 Flashes	90
ECU Failure	11 Flashes	93, 99, and E-Codes

Note: If the Simple Mode Code does not show a fault code, but the ABS Light remains "**ON**" after powering the ABS, there are no active faults present. Verify in Mode 3 (Stored Codes). If any faults 11 - 16 or 21 - 26 are present the problem needs to be resolved before the ABS Light will turn off when Permanent Powered vehicle travels greater than 6 mph.

Wheel Speed Mode:

Wheel Speed Mode is accessible only in Simple Mode. This Simple Mode is not activated until ECU (Electrionic Control Unit) has received a signal from the wheel speed sensor of a spinning wheel. The hold solenoid of the Modulator Valve associated with the particular sensed spinning wheel will be cycled the same number of times as the ABS Light flashes. The Blink Code for the sensed wheels are as follows:

S1A: 1 Flash S1B: 2 Flashes S2A: 3 Flashes

S2B: 4 Flashes S3A: 5 Flashes S3B: 6 Flashes

Note 1: Spin only one wheel at a time.

Note 2: Once a wheel is rotated, the ABS Light will remain "**ON**" after the wheel is stopped until the next wheel is rotated.

Mode 2 - Active Faults Mode (ON, OFF, ON, OFF, ON):

In this mode the ABS Light displays a numerical Fault Code Sequence for each existing fault, up to nine fault codes at a time. The nine faults must be repaired before additional active faults can be displayed. The Blink Codes used in the Active Fault Mode are related to the Haldex Standard Fault Codes and are shown on (Pages 29 - 33).

Example: Fault Code "23" is indicated by the light flashing "**ON**" twice for 1/2 second each time then off for 2 seconds followed by three 1/2 second flashes.

1st Flash Sequence

2nd Flash Sequence

Mode 3 - Stored (Passive) Faults/Clear Mode (ON, OFF, ON, OFF, ON, OFF, ON):

In this mode the ABS Light displays a numerical fault code sequence for each stored fault. All stored faults (not currently active) are displayed in this mode. The light will display up to nine passive stored faults at a time. The stored faults are displayed in numerical order, highest to lowest. The Blink Codes used in the Passive Stored Fault Mode are related to the Haldex Standard Fault Codes and are shown on (Pages 36 - 40).

Stored Mode Fault Occurrences (Mode 3):

The Fault Code Blink Sequence is followed by the occurrence count for that fault in Passive Mode. The occurrence count is displayed after each pair of fault code flashes in order to differentiate between the code and its occurrence count. Blink Code rate twice as fast as the Fault Code blink rate.

Verify if stored codes 11 - 16 or 21 - 26 are present, the problem needs to be resolved before the ABS Light will shut off when Permanent Powered vehicle travel greater than 6 mph.

Clearing Stored Code (Mode 3):

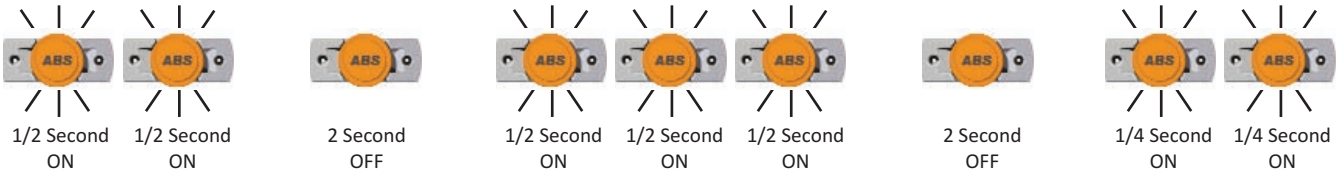
The Passive Stored Fault Codes may be cleared by switching ignition power **OFF**, **ON**, **OFF**, **ON** while the brakes are applied during the 10 seconds of light energization that occurs prior to each repeat of the Fault Code Blink Sequence. The light will flash rapidly for 10 seconds to show that the fault(s) are being erased.

PLC Select 1M/2M - Blink Code Diagnostics

Stored Fault Mode Notes (Mode 3):

1. A “Zero” for codes such as “**01**” is indicated by a two second light “**ON**” condition. All other digits are indicated by a half second light “**ON**” condition.

Example: Fault Code “**23**” is indicated by the light flashing “**ON**” twice for 1/2 second each time then off for 2 seconds followed by three 1/2 second flashes. The third flash is the occurrence count and as 1/4 second flashes.



1st Flash Sequence (1st fault code digit)

2nd Flash Sequence (2nd fault code digit)

3rd Flash Sequence (Occurrence Count)

2. There is a two second light “**OFF**” delay between the digits in each code.

3. Code “**07**” (System OK, vehicle is parked) is displayed as a continuous light “**ON**” condition. If No Stored Faults are present, the lamp will remain on continuously.

Mode 4 - Configuration Mode (ON, OFF, ON, OFF, ON, OFF, ON, OFF, ON):

This Mode displays Configuration and Auxillary Codes. The Configuration Code is displayed prior to Auxiliary Codes. The Tables on (Pages 36 - 40) shows a list of Configuration Codes and a list of Auxiliary Codes which supported by Blink Codes. Auxiliary Codes are displayed Low to High. Each Blink Code digit will reference to a digit in the Haldex Configuration Codes.

Config Code	Blink	Function	Lift Axle	Sensor Used (Indicates Lift Axle)	Modulators Used
CO	1	2S/1M		S1A S1B	Red
C1	2	2S/2M		S2A S2B	Blue, Yellow
C2	3	4S/2M		S3A S2A S2B S3B	Blue, Yellow

Item	Blinks	Description
A4	5	No load sense valve - momentarily displayed when power is applied
A5	6	Not Applicable
A6	7	Not Applicable
A7	8	SLH programming for Yellow Valve Channel (Red Valve is 2S/1M)
A8	9	MSLH programming for Yellow Valve Channel (Red Valve is 2S/1M)

Clearing Configuration Mode:

(Only required for product made before 2012)

The Configuration Codes may be cleared by switching Permanent Power **OFF**, **ON**, **OFF**, **ON** while the brakes are applied during the 10 seconds of light energization that occurs prior to each repeat of the Fault Code Blink Sequence. The light will flash rapidly for 10 seconds to indicate that the configuration has been erased from the ECU (Electronic Control Unit) memory. The ECU (Electronic Control Unit) will then store its full configuration on the next power up.

Mode 5 - Odometer Mode (ON, OFF, ON, OFF, ON, OFF, ON, OFF, ON, OFF, ON)

This mode display the Odometer Value.

Example: 4364.7 miles (4 ON/OFF, 1/2 Sec Flashes, 3 ON/OFF, 1/2 Sec Flashes, 6 ON/OFF 1/2 Sec Flashes, 4 ON/OFF, 1/2 Sec Flashes) then 2 ON/OFF 1/4 Sec Flashes if set for miles, 1 ON/OFF 1/4 Sec Flash if set for kms.

PLC Select 1M/2M - Tire Scale Factor Chart

Tire Size - 100T

Tire Size - 80T

100-Tooth Exciter Ring
80-Tooth Exciter Ring

Trailer Tire	Scale Factor 100T (Miles)	Scale Factor 100T (km)	Scale Factor 80T (Miles)	Scale Factor 80T (km)
80T Smallest Tire			**579**	**360**
215/75R17.5			543	338
8R17.5			538	334
275/65R17.5 HC			527	328
8.5/R17.5			524	326
245/70R17.5			523	325
235/75R17.5			523	325
225/70R19.5			521	324
8.25R15			495	308
9R17.5 HC			495	308
10R17.5			490	304
265/70R19.5			483	300
285/70R19.5			470	293
100T Smallest Tire	**580**	**360**		
305/70R19.5	574	357	459	286
11R17.5 HC	568	353	454	283
10.00R15 Tire	566	352	453	282
255/70R22.5	566	352	453	282
275/70R22.5	545	339	436	271
10R22.5	520	323	416	259
9.00R20	519	323	415	258
295/75R22.5	518	322	414	258
285/75R24.5	504	313	403	251
295/80R22.5	503	313	402	250
11R22.5	**(502*)**	313	402	250
10.00R20	501	312	401	249
315/80R22.5	491	305	383	244
80T Largest Tire			**391**	**243**
11.00R20	488	303		
305/75R24.5	488	303		
11R24.5	478	297		
10.00R22	478	297		
12.00R20	472	294		
425/65R22.5	471	293		
11.00R22	466	290		
100T Largest Tire	**391**	**243**		

*Haldex Factory Tire Scale Set at Default 502 Rev/Mile.

Useful Numbers: 1 mile = 1.6093 km 1 km = 0.6214 miles

Scale Factor (SF) for other size:

Option 1: SF = (1000/Rc) X (T/100)
Rc = Rolling Circumference in Meters
T = Exciter Actual Tooth Count

Option 2: SF = N X (T/1000)
N = Revolutions per mile
T = Exciter Actual Tooth Count

Note: Scale factor does not affect ABS performance but does affect odometer accuracy.

Troubleshooting ABS Warning Light
PLC Select 1M/2M

ABS Warning Light Stays On Permanently:

Upon power up of the ABS System (Permanently or Stoplight Power), the ABS Warning Lights should come "**ON**" for 3 seconds and then go "**OFF**". If the ABS Warning Light stays "**ON**", it may be caused by improper light wiring, or by a fault in the ABS System.

1. Check for Diagnostic Fault Codes. If anything other than a "**07**" is displayed, review the "Troubleshooting section of this manual (Pages 36 - 40) for possible solutions. After the problem is repaired, clear all stored faults and test again.
2. If a "**07**" is displayed but there was a 11 - 16, or 21 - 26 stored in memory, then correct the problem and drive the trailer or rotate the wheel affected > 1 mph using Permanently Power to get the ABS Light to turn "**OFF**".
3. If there are no stored faults and a "**07**" is displayed, and the ABS Light is still "**ON**", then the ABS Light is mis-wired. Remove the main wire harness 5 pin connector at the ECU (Electronic Control Unit) and verify continuity between pin "D" (Reference ABS Power Cord pin out (Page 18) and Trailer ABS Light. The remaining light wire must be grounded to the trailer chassis or connected to the SAE J560 7-Way connector ground wire. Check for continuity between the ABS Light wire and ground. Repair as necessary and retest.
4. If the solenoid does not energize **"CLICK, CLICK"** when power is applied or the diagnostic tool has nothing on the display, check power on the Blue or Red wire of the 7-Way connector as well as the ABS Power Cord. Reference ABS Power Cord pin out (Page 18). Verify power source is > 10 Volts when connected to ABS.

No ABS Warning Light Illumination:

1. Check the bulb to verify that is functional. If not functional, replace it and retest.
2. Verify that there is power to the ECU (Electronic Control Unit) and the solenoid energizer **"CLICK, CLICK"**. If not disconnect the main wire harness 5 pin connector and check for positive power between either Stop Light Power with brakes applied or Permanently Power and ground (Reference ABS Power Cord pin out (Page 18). The voltage drop between the SAE J560 7-Way and the ECU (Electronic Control Unit) should not exceed 2 volts. If no power exists at either Stop Light or Permanently Power in reference to ground then check continuity from these pins to the SAE J560 7-Way connector Red and Blue circuits. Make necessary repairs and retest. Verify power source is > 10 Volts when connected to ABS.
3. If the problem is still present, remove the main wire harness 5 pin connector at the ECU (Electronic Control Unit) and verify continuity between pin "D". Reference ABS Power Cord - pin out (Page 18) and the light. The remaining light wire must be grounded to the trailer chassis or connector to the SAE J560 7-Way connector ground wire. Check for continuity between the ABS Light and ground. Repair as necessary and retest.

Troubleshooting PLC Select 1M/2M Diagnostic Codes

Red Channel Valve
Blue Channel Valve
Yellow Channel Valve

Fault Code	PLC Select 1M	PLC Select 2M	Explanation: (Occurs when vehicle is Stationary)	Possible Causes:
00	X	X	System OK (with vehicle traveling > 6 mph)	ABS is Operational Displays “00” when traveling greater > 6 mph
01	X		Red Channel - Wheel speed sensor wiring (S1A) has an Open or Short Circuit	Indicates a wheel speed sensor or it wiring has short or open circuit. Disconnect the relevant sensor and measure the resistance between the two pins in the sensor connector housing. If sensors extensions are used verify extension continuity and connections. Replace sensor and/or extension cable. The Ohm meter reading for the sensor or sensor and extension cable should be between **980 and 2350 Ohm (.98K and 2.35 K Ohm) If not, replace sensor and/or extension cable**.
02	X		Red Channel - Wheel speed sensor wiring (S1B) has an Open or Short Circuit	
03		X	Blue Channel - Wheel speed sensor wiring (S2A) has an Open or Short Circuit	
04		X	Yellow Channel - Wheel speed sensor wiring (S2B) has an Open or Short Circuit	
05		X	Blue Channel - Wheel speed sensor wiring (S3A) has an Open or Short Circuit	
06		X	Yellow Channel - Wheel speed sensor wiring (S3B) has an Open or Short Circuit	
07	X	X	System OK (No Active Faults)	Vehicle is static at 0 mph
Fault Code	**PLC Select 1M**	**PLC Select 2M**	**Explanation: (Occurs when vehicle is Moving)**	**Possible Causes:**
11	X		Red Channel - Speed sensor (S1A), has low sensor output	Sensor or spring clip is worn or not properly adjusted, wiring open or short circuit, wheel bearing not properly adjusted **(these faults will only occur at speed greater than 6 mph)**. Measure the AC voltage at the sensor in question while rotating the wheel at a rate of about one revolution every two seconds. The output should be at least **200 millivolts (0.2 VAC)**. If this is not the case, push in the sensor until it touches the exciter and rotate the wheel again. If this doesn’t correct the problem, then replace the sensor and sensor block clip. If sensor extensions are used verify extension continuity and connections. Replace sensor and/or extension cable. Inspect exciter ring teeth for minor damage or teeth filled with debris. Verify all exciters have the same number of teeth. Verify all sensor and valve wiring/plumbing is correct. See (Side-By-Side) (Axle-By-Axle) configuration Plumbing of solenoid valves must correspond with the correct sensors depending on (Side-By-Side) or (Axle-By-Axle) configurations.
12	X		Red Channel - Speed sensor (S1B), has low sensor output	
13		X	Blue Channel - Speed sensor (S2A), has low sensor output	
14		X	Yellow Channel - Speed sensor (S2B), has low sensor output	
15		X	Blue Channel - Speed sensor (S3A), has low sensor output	
16		X	Yellow Channel - Speed sensor (S3B), gap too large. Gap should be kept to a minimum	

Troubleshooting PLC Select 1M/2M Diagnostic Codes

Red Channel Valve
Blue Channel Valve
Yellow Channel Valve

Fault Code	PLC Select 1M	PLC Select 2M	Explanation: (Occurs when vehicle is Moving)	Possible Causes:
21	X		Red Channel - Wheel speed sensor (S1A) has an erratic output voltage	Loose sensor, connection, bracket or exciter, damaged exciter, sensor is not properly adjusted or has worn cable insulation, or worn sensor block clip, wheel bearing failure, wheel bearing is not properly adjusted **(these faults will only occur at speed greater than 6 mph)**. Measure the AC voltage at the sensor in question while rotating the wheel at a rate of about one revolution every two seconds. The output should be at least **200 millivolts (0.2 VAC)**. If this is not the case, push in the sensor until it touches the exciter and rotate the wheel again. If this doesn't correct the problem, then the sensor, and sensor block clip should be replaced. Verify tire and wheel size is large enough for 100 tooth exciter ring. If these faults re-occur at the same speed, inspect exciter ring for damage. Smaller wheel and tires require 80 tooth exciter rings. Reference Tire Scale Factor Chart. Verify sensor and valve wiring/plumbing is correct. See (Side-By-Side) and (Axle-By-Axle) configuration. Plumbing of solenoid valves must correspond with the correct sensors depending on Side-By-Side or Axle-By-Axle configurations.
22	X		Red Channel - Wheel speed sensor (S1B) has an erratic output voltage	
23		X	Blue Channel - Wheel speed sensor (S2A) has an erratic output voltage	
24		X	Yellow Channel - Wheel speed sensor (S2B) has an erratic output voltage	
25		X	Blue Channel - Wheel speed sensor (S3A) has an erratic output voltage	
26		X	Yellow Channel - Wheel speed sensor (S3B) has an erratic output voltage	
Fault Code	**PLC Select 1M**	**PLC Select 2M**	**Explanation: (Occurs when vehicle is Stationary)**	**Possible Causes:**
31			Auxiliary Channel - 1 fault (Digital Channel 1) output only	**PLC Select 2M Plus (ABS Auxiliary Codes)** **Note:** These codes are only used with PLC Select 2M Plus ABS that supports Trailer Auxiliaries. Auxiliary Channel has an open circuit or the ECU (Electronic Control Unit) has auxiliary device connected and is not programmed to be. **Note:** These codes do not affect ABS performance and does not illuminate the tractor or trailer ABS warning lamps.
32			Auxiliary Channel - 2 fault (Digital Channel 2) output only	
33			Auxiliary Channel - 3 fault (Digital Channel 3) input only	
34			Auxiliary Channel - 4 fault (Digital/Analog Channel 1) input only	
35			Auxiliary Channel - 5 fault (Digital/Analog Channel 2) input only	

Troubleshooting PLC Select 1M/2M Diagnostic Codes

Red Channel Valve
Blue Channel Valve
Yellow Channel Valve

Fault Code	PLC Select 1M	PLC Select 2M	**Explanation: (Occurs when vehicle is Stationary or Moving)**	**Possible Causes:**
41	X		Red Channel Valve - Slow Wheel Recovery (occurs when vehicle is moving)	For a 2M System, verify sensor and valve wiring/ plumbing is correct. (See Side-By-Side and Axle By-Axle) configuration. Slow brake release, foundation brake mechanical faults, dry bushings, broken ABS valve, restricted piping. Check for kinks and blockage etc. Incorrect airlines, wiring, open circuit.
42		X	Blue Channel Valve - Slow Wheel Recovery (occurs when vehicle is moving)	
43		X	Yellow Channel Valve - Slow Wheel Recovery (occurs when vehicle is moving)	
61	X		Red Channel Valve - Hold Solenoid Open Circuit (occurs when vehicle is stationary or moving)	Modulator valve open circuit solenoid failure, solenoid connection, or valve cable damage. The most likely causes include: a bad solenoid, or a loose solenoid connection. Disconnect the indicated solenoid and check the resistance at the solenoid pins. Check the female terminals on the connector for excessive pin spread or corrosion. Replace defective hardware as required and retest. (Reference to Solenoid Page 42 for pin out and resistance).
62		X	Blue Channel Valve - Hold Solenoid Open Circuit	
63		X	Yellow Channel Valve - Hold Solenoid Open Circuit	
67	X		Red Channel Valve - Dump Solenoid Open Circuit	
68		X	Blue Channel Valve - Dump Solenoid Open Circuit	
69		X	Yellow Channel Valve - Dump Solenoid Open Circuit	
71	X		Red Channel Valve - Hold Solenoid Short Circuit to Ground	Modulator valve short to ground solenoid failure, or valve cable damage. The most likely causes include: a damaged cable or solenoid. Example: A worn or chafed cable that has been exposed wire contacting the trailer. Disconnect the indicated solenoid and check the resistance at the solenoid pins. (Reference to Solenoid Page 42 for pin out and resistance).
72		X	Blue Channel Valve - Hold Solenoid Short Circuit to Ground	
73		X	Yellow Channel Valve - Hold Solenoid Short Circuit to Ground	
77	X		Red Channel Valve - Dump Solenoid Short Circuit to Ground	
78		X	Blue Channel Valve - Dump Solenoid Short Circuit to Ground	
79		X	Yellow Channel Valve - Dump Solenoid Short Circuit to Ground	

Troubleshooting PLC Select 1M/2M Diagnostic Codes

Red Channel Valve
Blue Channel Valve
Yellow Channel Valve

Fault Code	PLC Select 1M	PLC Select 2M	Explanation: (Occurs when vehicle is Stationary or Moving)	Possible Causes:
80	X	X	Output leakage or poor insulation on any of the valve channels.	Modulator valve solenoid failure or valve cable damage. Indicates that the solenoid or its cable has a short circuit to positive power (12 volts DC). The most likely cause is a damaged cable or solenoid. Disconnect the indicated solenoid and check the resistance at the solenoid pins. (Reference to Solenoid Page 42 for pin out and resistance). If solenoid check good and 80 - 89 code still exits, check ECU (Electronic Control Unit) for proper operation.
81	X		Red Channel Valve - Hold Solenoid Short Circuit to Permanent Power	
82		X	Blue Channel Valve - Hold Solenoid Short Circuit to Permanent Power	
83		X	Yellow Channel Valve - Hold Solenoid Short Circuit to Permanent Power	
87	X		Red Channel Valve - Dump Solenoid Short Circuit to Permanent Power	
88		X	Blue Channel Valve - Dump Solenoid Short Circuit to Permanent Power	
89	X	X	Yellow Channel Valve - Dump Solenoid Short Circuit to Permanent Power	
90	X	X	Low Supply Voltage Fault.	Occurs when power source is < 8 volts. Verify power source is > 10 volts when connected to ABS.
91	X	X	No internal ABS ECU (Electronic Control Unit) solenoid voltage available	Verify Permanent Power is Present.
92	X	X	Power input over voltage fault	Verify 12 VDC power source. Do Not Use Battery Charger as Power Supply. ECU (Electronic Control Unit) maximum operating voltage is 16.0 VDC.
93	X	X	Short Circuit on ABS ECU (Electronic Control Unit) internal relay	Replace ECU (Electronic Control Unit)
99	X	X	ABS Corrupt Memory	
9A	X	X	ABS Corrupt Memory	

Troubleshooting PLC Select 1M/2M Diagnostic Codes

Red Channel Valve
Blue Channel Valve
Yellow Channel Valve

Fault Code	PLC Select 1M	PLC Select 2M	Explanation: (Occurs when vehicle is Stationary or Moving)	Possible Causes:
Code A(x) and C(x) displayed when power is applied to the ABS ECU (Electronic Control Unit). They should not be displayed for more then 2 seconds; if the code remains permanently displayed, repair is necessary.				
A7	X	X	Trailer: 2S/1M - SLH on Red Channel Trailer: 2S/2M, or 4S/2M - SLH on Yellow Channel	Programmed for Tandem or Multi-Axle Trailers. Displays current configuration.
A8	X	X	Trailer: 2S/1M - MSLH on red Channel (Dollies, Steerable or Single Axle Only)	Programmed for Dollies, Single or Steer Axle Trailer Displays current configuration.

Fault Code	PLC Select 1M	PLC Select 2M	Explanation: (Occurs when vehicle is Stationary or Moving)	Possible Causes:
Code A(x) and C(x) displayed when power is applied to the ABS ECU (Electronic Control Unit). They should not displayed for more then 2 seconds; if the code remains permanently displayed, repair is necessary.				
CO	X	X	2S/1M Configuration	S1A, S1B sensors, Red Modulator. ECU is configured as a 2M and is powered up as a 1M. See “CC” cause below. Displays current configuration.
C1	X	X	2S/2M Configuration	S2A, S2B sensors. Blue, Yellow Modulator. ECU is configured as a 4S/2M and powered up as a 2S/2M. See “CC” cause below. Displays current configuration.
C2	X	X	4S/2M Configuration Information (Not a Fault Code)	S3A, S2A, S2B, and S3B sensors. Blue and Yellow Modulators. Displays current configuration.
C3	X	X	4S/2M Configuration Information (Not a Fault Code)	S3A, S2A, S2B, and S3B sensors. Blue and Yellow Modulators. (S3A, and S3B sensed lift axle). Displays current configuration.
CA	X	X	Clear All (Fault Codes)	Occurs when clearing fault codes with the Info Center.
CC	X	X	Clear Configuration	Only required when configured ABS System from a 4S/2M to a 2S/2M or any 2M configured to a 1M. Clear fault codes 3 times with uninterrupted power to reconfigure.
CF	X	X	Configuration Fault	Unrecognized ABS configuration. Verify all sensors and valve connections are correct. Verify sufficient power.
E(x)	X	X	Internal problem exist within ABS ECU	ABS ECU is defective, replace.

J1587/J1708 Fault Codes

Red Channel Valve
Blue Channel Valve
Yellow Channel Valve

2S/1M Only - Sensor S1A & S1B - (Select IM/2M) - (Side-By-Side)

Fault Code	SID	FMI	SID as Standard SAE Displays Text	SAE Standard FMI	Description
01	01	05	Wheel Sensor ABS Axle 1 (Left)	Open Circuit	S1A Curb Side
02	02	05	Wheel Sensor ABS Axle 1 (Right)	Open Circuit	S1B Road Side
11	01	13	Wheel Sensor ABS Axle 1 (Left)	Out of Calibration	S1A Curb Side
12	02	13	Wheel Sensor ABS Axle 1 (Right)	Out of Calibration	S1B Road Side
21	01	02	Wheel Sensor ABS Axle 1 (Left)	Data Erratic, Intermittent	S1A Curb Side
22	02	02	Wheel Sensor ABS Axle 1 (Right)	Data Erratic, Intermittent	S1B Road Side
41	07	07	Pressure Mod Valve ABS Axle 1 (Left)	Mechanical Failure	Red Channel Both Sides
61	42	05	Hold Mod Valve ABS Axle 1 (Left)	Open Circuit	Red Channel Both Sides
67	48	05	Dump Mod Valve ABS Axle 1 (Left)	Open Circuit	Red Channel Both Sides
71	42	04	Hold Mod Valve ABS Axle 1 (Left)	Voltage Shorted to Ground	Red Channel Both Sides
77	48	04	Dump Mod Valve ABS Axle 1 (Left)	Voltage Shorted to Ground	Red Channel Both Sides
80	13	11	Retarder Control Relay	Failure Not Indefinable	Failure Not Indefinable
81	42	03	Hold Mod Valve ABS Axle 1 (Left)	Voltage Shorted to B+	Red Channel Both Sides
87	48	03	Dump Mod Valve ABS Axle 1 (Left)	Voltage Shorted to B+	Red Channel Both Sides
90	251	01	Power Supply	Data Below Normal Range	Power < 8 Volts
91	251	04	Power Supply	Voltage Below Normal	Defective ECU
92	251	03	Power Supply	Voltage Above Normal	Power > 16.0 Volts
93	13	12	Retarder Control Relay	Bad Device or Component	Defective ECU
99	253	12	Calibration Memory	Bad Device or Component	Defective ECU

Note:

Standard SAE tool only pertain to Side-By-Side ABS Installation configuration. **Do Not** use standard SAE Diagnostic Tool for (Axle-By-Axle) ABS installation. Use Haldex Diagnostic Tool to determine if the problem is on the Curb or Road Side.

J1587/J1708 Fault Codes

Red Channel Valve
Blue Channel Valve
Yellow Channel Valve

2S/2M - Sensor (S2A & S2B) - (Select 2M) - (Side-By-Side)
4S/2M - Sensor (S2A, S2B, S3A, & S3B) - (Select 2M) - (Side-By-Side)

Fault Code	SID	FMI	SID as Standard SAE Displays Text	SAE Standard FMI	Description
03	03	05	Wheel Sensor ABS Axle 2 (Left)	Open Circuit	S2A Curb Side
04	04	05	Wheel Sensor ABS Axle 2 (Right)	Open Circuit	S2B Road Side
05	05	05	Wheel Sensor ABS Axle 3 (Left)	Out of Calibration	S3A Curb Side
06	06	05	Wheel Sensor ABS Axle 3 (Right)	Out of Calibration	S3B Road Side
13	03	13	Wheel Sensor ABS Axle 2 (Left)	Open Circuit	S2A Curb Side
14	04	13	Wheel Sensor ABS Axle 2 (Right)	Open Circuit	S2B Road Side
15	05	13	Wheel Sensor ABS Axle 3 (Left)	Out of Calibration	S3A Curb Side
16	06	13	Wheel Sensor ABS Axle 3 (Right)	Out of Calibration	S3B Road Side
23	03	02	Wheel Sensor ABS Axle 2 (Left)	Open Circuit	S2A Curb Side
24	04	02	Wheel Sensor ABS Axle 2 (Right)	Open Circuit	S2B Road Side
25	05	02	Wheel Sensor ABS Axle 3 (Left)	Out of Calibration	S3A Curb Side
26	06	02	Wheel Sensor ABS Axle 3 (Right)	Out of Calibration	S3B Road Side
42	09	07	Pressure Mod Valve ABS Axle 2 (Left)	Mechanical Failure	Blue Channel Curb Side
43	07	07	Pressure Mod Valve ABS Axle 1 (Left)	Mechanical Failure	Yellow Channel Road Side
62	44	05	Hold Mod Valve Solenoid Axle 2 (Left)	Open Circuit	Blue Channel Curb Side
63	42	05	Hold Mod Valve Solenoid Axle 1 (Left)	Open Circuit	Yellow Channel Road Side
68	50	05	Dump Mod Valve Solenoid Axle 2 (Left)	Open Circuit	Blue Channel Curb Side
69	48	05	Dump Mod Valve Solenoid Axle 1 (Left)	Open Circuit	Yellow Channel Road Side
72	44	04	Hold Mod Valve Solenoid Axle 2 (Left)	Voltage Shorted to Ground	Blue Channel Curb Side
73	42	04	Hold Mod Valve Solenoid Axle 1 (Left)	Voltage Shorted to Ground	Yellow Channel Road Side

Note:

Standard SAE tool only pertain to Side-By-Side ABS Installation configuration. **Do Not** use standard SAE Diagnostic Tool for (Axle-By-Axle) ABS installation. Use Haldex Diagnostic Tool to determine if the problem is on the Curb or Road Side.

Red Channel Valve
Blue Channel Valve
Yellow Channel Valve

2S/2M - Sensor (S2A & S2B) - (Select 2M) - (Side-By-Side)
4S/2M - Sensor (S2A, S2B, S3A, & S3B) - (Select 2M) - (Side-By-Side)

Fault Code	SID	FMI	SID as Standard SAE Displays Text	SAE Standard FMI	Description
78	50	04	Dump Mod Valve Solenoid Axle 2 (Left)	Voltage Shorted to Ground	Blue Channel Curb Side
79	48	04	Dump Mod Valve Solenoid Axle 1 (Left)	Voltage Shorted to Ground	Yellow Channel Road Side
80	13	11	Retarder Control Relay	Failure Not Indefinable	Failure Not Indefinable
82	44	03	Hold Mod Valve Solenoid Axle 2 (Left)	Voltage Shorted to B+	Blue Channel Curb Side
83	42	03	Hold Mod Valve Solenoid Axle 1 (Left)	Voltage Shorted to B+	Yellow Channel Road Side
88	48	03	Dump Mod Valve Solenoid Axle 1 (Left)	Voltage Shorted to B+	Blue Channel Curb Side
89	50	03	Dump Mod Valve Solenoid Axle 2 (Left)	Voltage Shorted to B+	Yellow Channel Road Side
90	251	01	Power Supply	Data Below Normal Range	Power < 8.0 Volts
91	253	04	Power Supply	Voltage Below Normal	Defective ECU
92	251	03	Power Supply	Voltage Above Normal	Power > 16.0 Voltage
93	13	12	Retarder Control Relay	Bad Device or Component	Defective ECU
99	253	12	Calibration Memory	Bad Device or Component	Defective ECU

Note:

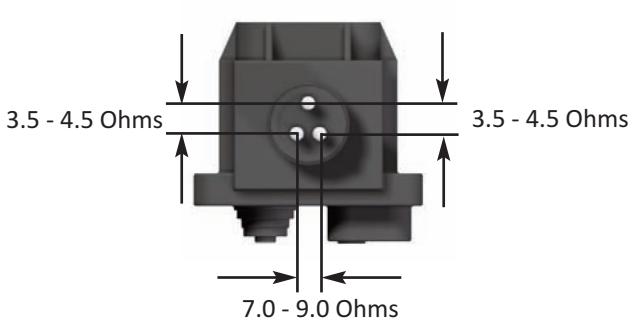
Standard SAE tool only pertain to Side-By-Side ABS Installation configuration. **Do Not** use standard SAE Diagnostic Tool for (Axle-By-Axle) ABS installation. Use Haldex Diagnostic Tool to determine if the problem is on the Curb or Road Side.

Solenoids:

Old Style Solenoid (Pre-DIN)
New Style Solenoid (DIN) - September 2009 - Present

Use a Voltage Meter to measure the Ohms across the Solenoid Pins as shown below.

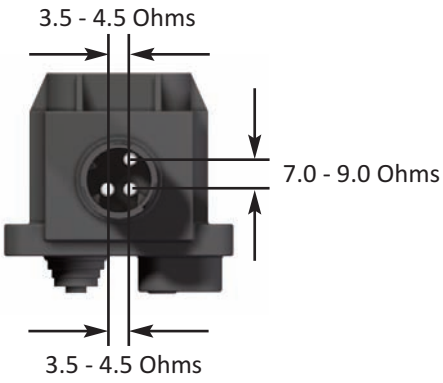
Voltage Meter



Old Style Solenoid (Pre-DIN)

1. Common
2. Hold
3. Dump

Voltage Meter



New Style Solenoid (DIN)

1. Common
2. Hold
3. Dump

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Haldex Brake Products
10930 North Pomona Ave
Kansas City, Missouri 64513

Technical Service & Engineering Support
1 (800) 643-2374 (Press 2) or Ext. 2337

In Canada, Please Call

Haldex Limited/Haldex Limitée
500 Pinebush Road, Unit 1
Cambridge, ON
N1T 0A5
Canada

Technical Service & Engineering Support
1 (800) 267-9247 (Press 2)

Notes:

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Haldex develops and provides reliable and innovative solutions that improve safety, vehicle dynamics and environmental sustainability in the global commercial vehicle industry. Listed on the Stockholm Stock Exchange, Haldex had net sales of approximately 4 billion SEK in 2011 and employs 2,350 people.

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